COMMENTS

Comments received for CHA Draft Report *(December 18, 2009,* CHA Project No. 20085.9000.1510*)* for the Assessment of Dam Safety of Coal Combustion Surface Impoundments Louisville Gas & Electric Company – Cane Run Power Station, Louisville, KY. Comments include;

- EPA comments - None;
- KYDNR comments received on January 28, 2010; and
- Louisville Gas & Electric Company comments received on February 23, 2010.

E.ONLGE Comments and Additional Studies for Cane Run Plant
From: Kohler.James@epamail.epa.gov
Sent: Monday, March 01, 2010 5:11 PM
To: dennis.a.miller@lmco.com; Hargraves, Malcolm; Hoffman.Stephen@epamail.epa.gov; Harris IV, Warren; Everleth, Jennifer
Subject: E.ON/LGE Comments and Additional Studies for Cane Run Plant

Dear CHA:

Please follow the link below to download the company comments for Cane Run...please address/incorporate accordingly.

They have also included additional geotech studies conducted by MACTEC on their impoundments. It seems their delay in providing comments stemmed from waiting on the MACTEC reports dated 2.23.10. They are wanting the ratings changed based on the results of these reports.

E.ON/LGE would like to set up a meeting to discuss after your review.
Please let us know what you think. Thanks!

Jim

LGE Comments and Additional Studies
https://www.yousendit.com/download/RmNEYUlzQ1BrWTljR0E9PQ

****
Jim Kohler, P.E.
Environmental Engineer
LT, U.S. Public Health Service
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Phone: 703-347-8953
Fax: 703-308-0514
****

|------------>
| From: |
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>--|
|James Kohler/DC/USEPA/US |

>--|
|------------>
| To: |
|------------>

>--|
|dennis.a.miller@lmco.com, MHargraves@chacompanies.com, "Harris IV, Warren" <WHarris@chacompanies.com> |

>--|
|------------>
| Cc: |
|------------>

>--

FW Comments on Draft Reports E.ONKentucky Utilities Ghent and Cane Run Facilities
From: Harris IV, Warren
Sent: Wednesday, February 03, 2010 2:22 PM
To: Everleth, Jennifer; Adnams, Katy
Subject: FW: Comments on Draft Reports: E.ON/Kentucky Utilities Ghent and Cane Run Facilities

Attachments: State Comments on Ash Pond inspections located within Kentucky.doc

-----Original Message-----
From: Kohler.James@epamail.epa.gov [mailto:Kohler.James@epamail.epa.gov]
Sent: Wednesday, February 03, 2010 2:20 PM
To: dennis.a.miller@lmco.com; Hargraves, Malcolm; Harris IV, Warren
Cc: Hoffman.Stephen@epamail.epa.gov
Subject: Comments on Draft Reports: E.ON/Kentucky Utilities Ghent and Cane Run Facilities

Dear Dennis/CHA:

I have sent you comments on the draft reports for all third round assessments except for E.ON/Kentucky Utilities Ghent and Cane Run facilities. We will be receiving company comments on these reports by Feb. 23. EPA has no comments on either report. The state comments are attached.

(See attached file: State Comments on Ash Pond inspections located within Kentucky.doc)

Please confirm receipt of these emails and comment docs on all third round draft assessment reports. Let me know if you have any questions.
Thanks!

Jim

****
Jim Kohler, P.E.
Environmental Engineer
LT, U.S. Public Health Service
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
Phone: 703-347-8953
Fax: 703-308-0514
****

Final Report
Assessment of Dam Safety of Coal Combustion Surface Impoundments
Louisville Gas & Electric Company – Cane Run Power Station
Louisville, KY

Comments Received from the EPA
In Response to CHA Draft Report dated December 18, 2009
None Received

CHA Project No. 20085.9000.1510

Final Report
Assessment of Dam Safety of Coal Combustion Surface Impoundments
Louisville Gas & Electric Company – Cane Run Power Station
Louisville, KY

Comments Received from KY DNR
In Response to CHA Draft Report dated December 18, 2009
Email dated January 28, 2010 and
Letter dated January 28, 2010

CHA Project No. 20085.9000.1510

From:	"Phelps, Scott (EEC)" <Scott.Phelps@ky.gov>
To:	James Kohler/DC/USEPA/US@EPA
Date:	01/28/2010 09:20 AM
Subject:	Comments from Kentucky on Ash Pond Reports

James
I am attaching our comments on the draft reports that were sent to me. It is my understanding that Gary Wells with our office has already supplied comments on the LG&E Mill Creek impoundment. Let me know if you need further clarification or anything else.

Scott Phelps P.E., C.F.M., Supervisor
Dam Safety and Floodplain
Compliance Section
Water Infrastructure Branch

Attachment:

Comments on Ash Pond inspections located within Kentucky.

General: Kentucky would like to correct a statement made in several of the draft reports. Many of the reports state that Kentucky does not have standards for dam stability. This statement is incorrect and should be corrected in all reports. The standards are clearly stated in “Guidelines for the Geotechnical Investigation and Analysis of Existing Earth Dams”. This publication is located on our website and available for download. The necessary factors of safety are found on page 25. The web address for the document is: http://www.water.ky.gov/damsafety/dsdownloads/

E.W. Brown Aux Pond.

The statement that the ash pond has a permit number KYDW Permit 1213 is incorrect. The Kentucky Division of Water has assigned dam ID number KY1213 to this structure. This is the number that the structure can be found under in the NID.

E.W. Brown Main Pond

3.2 Summary of Local, State and Federal Environmental Permits:
The statement that the ash pond has a permit number KYDW Permit 0737 is incorrect. The Kentucky Division of Water has assigned dam ID number KY0737 to this structure. This is the number that the structure can be found under in the NID.

Kentucky Utilities Ghent Power Plant

1.2.1 There is no mention of permits issued by the Kentucky Division of Water for Construction of ATB 2 or the Gypsum Stacking Facility.

3.3 Structural Adequacy & Stability

The statement that Kentucky regulations and guidelines for dam safety do not provide specific factors of safety for slope stability is incorrect. The standards are clearly stated in "Guidelines for the Geotechnical Investigation and Analysis of Existing Earth Dams". This publication is located on our website and available for download. The necessary factors of safety are found on page 25. The web address for the document is: http://www.water.ky.gov/damsafety/dsdownloads/

LG&E Cane Run

The map on page 9 indicates the wrong plant and places the plant in Indiana.

3.3 Structural Adequcy & Stability

The statement that Kentucky regulations and guidelines for dam safety do not provide specific factors of safety for slope stability is incorrect. The standards are clearly stated in "Guidelines for the Geotechnical Investigation and Analysis of Existing Earth Dams". This publication is located on our website and available for download. The necessary factors of safety are found on page 25. The web address for the document is: http://www.water.ky.gov/damsafety/dsdownloads/

4.1 Acknowledement of Management Unit Condition

Big Rivers Coleman Plant

3.3 Structural Adequacy & Stability

The statement that Kentucky regulations and guidelines for dam safety do not provide specific factors of safety for slope stability is incorrect. The standards are clearly stated in "Guidelines for the Geotechnical Investigation and Analysis of Existing Earth Dams". This publication is located on our website and available for download. The necessary factors of safety are found on page 25. The web address for the document is: http://www.water.ky.gov/damsafety/dsdownloads/

Big Rivers Reid, Green, HMPL

No comments from Kentucky Division of Water.

American Electric Power Big Sandy Generating Station

P.1 Company or Organization

The Kentucky Department of Natural Resources is a different agency than the Department for Environmental Protection. DEP is the correct agency for Scott Phelps.

3.3 Structural Adequacy & Stability

The statement that Kentucky regulations and guidelines for dam safety do not provide specific factors of safety for slope stability is incorrect. The standards are clearly stated in "Guidelines for the Geotechnical Investigation and Analysis of Existing Earth Dams". This publication is located on our website and available for download. The necessary factors of safety are found on page 25. The web address for the document is: http://www.water.ky.gov/damsafety/dsdownloads/

Final Report
Assessment of Dam Safety of Coal Combustion Surface Impoundments
Louisville Gas & Electric Company – Cane Run Power Station
Louisville, KY

Comments Received from Louisville Gas & Electric Company
In Response to CHA Draft Report dated December 18, 2009
Comments Received February 23, 2010

CHA Project No. 20085.9000.1510

Generation Engineering
220 West Main Street
Louisville, Kentucky 40202
T 1-502-627-2985

VIA EMAIL AND OVERNIGHT DELIVERY

Mr. Stephen Hoffman
U.S. Environmental Protection Agency
Two Potomac Yard
2733 South Crystal Drive
Fifth Floor, N-5237
Arlington, VA 22202-2733

February 23, 2010

Re: Louisville Gas & Electric's Comments for *DRAFT Assessment of Dam Safety, Coal Combustion Surface Impoundments (Task 3) Report, Cane Run Power Station*, Prepared by CHA, December 18, 2009

Dear Mr. Hoffman:

The U.S. Environmental Protection Agency (EPA) provided a draft report to Louisville Gas & Electric Company (LG&E) regarding coal combustion byproduct impoundments at Cane Run Power Station. CHA, an engineering contractor for EPA, prepared the draft report dated December 18, 2009. The draft report was prepared to present the results of an assessment of the structural stability of four impoundments at Cane Run. LG&E has reviewed the report, and has included clerical and technical corrections as Attachment 1.

LG&E conducted additional research of historical records regarding subsurface exploration or stability analysis. In January 2010, LG&E retained MACTEC Engineering and Consulting to conduct an engineering stability analysis on the Cane Run impoundments indentified by CHA as the ATB / E-Pond Complex and the Basin Pond / Dead Storage Pond Complex. MACTEC has provided LG&E two documents containing subsurface data and stability analysis which are included as attachments to this letter. LG&E requests that EPA arrange a conference to discuss this additional information with representatives of LG&E and CHA. LG&E believes that the additional information adds significantly to the background information and will help CHA produce a more complete final assessment report.

Engineers with CHA conducted a site visit on October 28, 2009 to inventory the impoundments at the Cane Run Station, to perform visual observations of the embankments and to collect information related to the assessment. LG&E transmitted background information to CHA in order to allow CHA to conduct the assessment. While on site following the visual observations in October, 2009 CHA engineers commented that they considered the impoundment ratings to be in fair or satisfactory range pending a review of the background information. CHA commented that the impoundments were visually in good condition. As CHA developed the draft report, they determined that there was not enough background information available to rate the impoundments as fair or satisfactory. The draft report indicates CHA rated the two impoundment complexes as poor based on the following observations: slope stability concern at the southwest portion of the Ash Pond/E-Pond Complex, slope stability concern on the Basin/Dead Storage Pond Complex, and absence of subsurface information and engineering stability analysis. EPA guidelines state that a poor rating should be applied when further critical studies or investigations are needed to identify potential dam safety deficiencies.

The stability analysis conducted by MACTEC in January and February of 2010 consists of a review of pertinent background data, geotechnical exploration, sample collection, installation of piezometers, topographic surveys, laboratory analysis, and computer modeling of the dam stability to determine safety factors. MACTEC conducted the stability analysis using *Guidelines for Geotechnical Investigation and Analysis for New and Existing Earth Dams*, as published on the Kentucky Division of Water (KDOW), Dam Safety and Floodplain Compliance website and as referenced in KDOW *Engineering Memorandum No. 5 (*EM-5*)*. EM-5 is incorporated by reference in 401 KAR 4:030.

MACTEC completed twenty-six borings at thirteen cross sections (ten cross sections on the ATB/E-Pond, and three cross sections on the Dead Storage Pond/Basin Pond Complex) to collect subsurface samples at locations MACTEC considered to be critical cross sections. MACTEC specifically completed borings at the southwest corner and the soil stockpile area of the ATB/E-Pond Complex and at the downstream slope of the Dead Storage Pond/Basin Pond Complex which have been identified by CHA as areas of concern. Subsurface samples have been examined by a MACTEC geotechnical engineer and selected for a regime of laboratory testing. The laboratory testing regime was completed and included twenty (20) soil plasticity tests (Atterberg Limits), twenty (20) grain size (sieve) analysis with hydrometer, 180 natural moisture content determinations, eleven (11) unit weight and natural moisture content determinations (undisturbed samples), sixteen (16) direct shear tests, and five (5) triaxial (CU) tests. MACTEC completed a slope stability analysis on nine (9) cross sections of the embankments for the following cases: steady state seepage at maximum surcharge pool (flood) condition, rapid drawdown condition, and seismic conditions from present pool elevation, including static and seismic conditions where stockpiled soil has been placed adjacent to the embankment crest on the ATB.

MACTEC analyzed the stability of the embankment cross sections including the cross sections identified as areas of concern by CHA using industry standards to model the embankment physical properties and the computer program STABL, developed by Purdue University. STABL uses a two-dimensional limit equilibrium method of analysis. MACTEC completed the analysis on nine of thirteen selected cross sections. MACTEC's analysis determined that **the impoundment embankments at Cane Run meet and exceed all US Army Corps of Engineers (USACE) and KDOW recommended stability safety factors for applicable loading conditions.** MACTEC transmitted data regarding the Cane Run impoundments which is attached with this letter as follows:

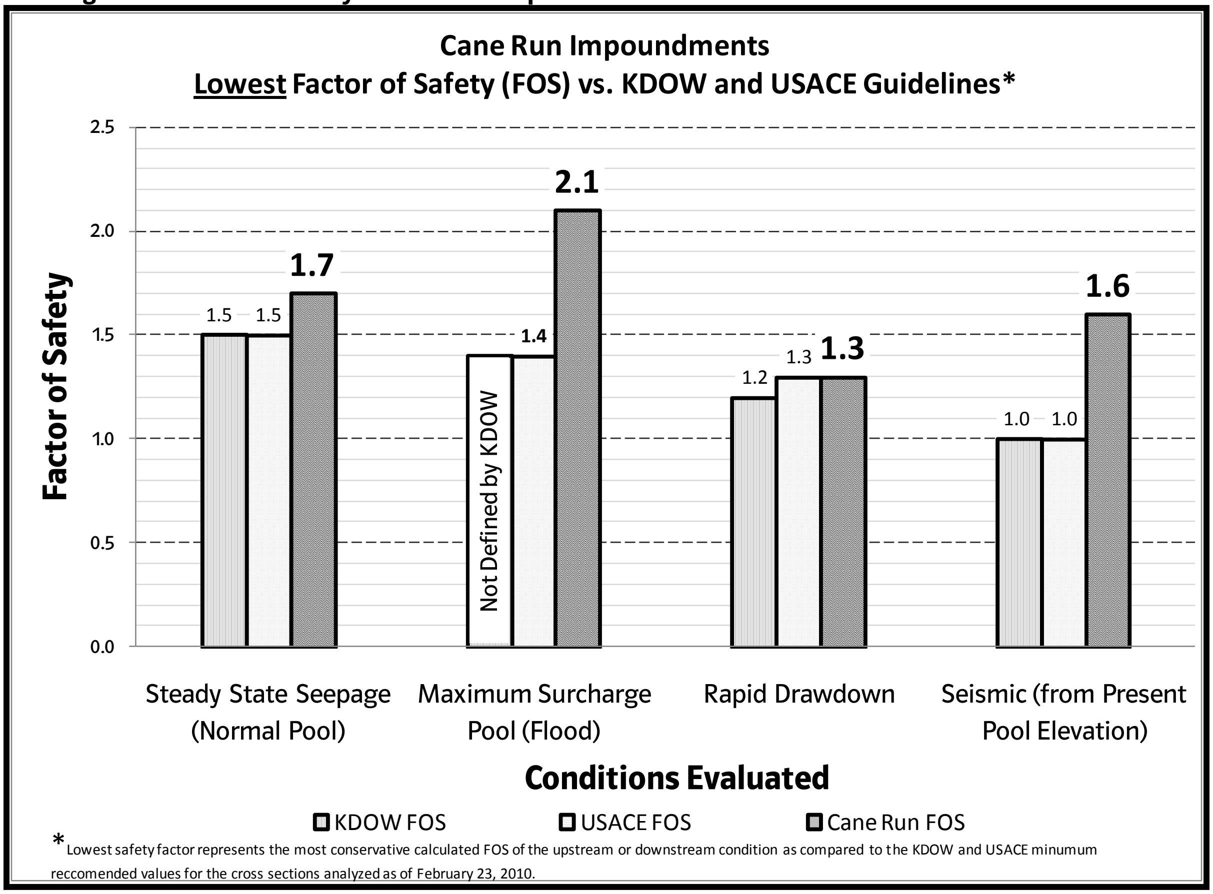
Attachment 2 - *Geotechnical Exploration and Slope Stability Analyses, Data Package: Ash Treatment Basin / E-Pond Complex*, MACTEC Engineering and Consulting, February 2010. Eight of ten cross sections modeled.

Attachment 3 - *Geotechnical Exploration and Slope Stability Analyses Data Package: Dead Storage / Basin Pond Complex*, MACTEC Engineering and Consulting, February 2010. One of three cross sections modeled.

This space intentionally left blank.

MACTEC has completed lab analysis for the remaining four cross sections. Based on the results of the lab analysis, MACTEC expects factors of safety for the remaining cross sections will meet regulatory guidelines. The results of this analysis are expected in mid March 2010, and LG&E will provide EPA with the results when available. Figure 1 illustrates the calculated safety factors as they compare to guidelines established by the KDOW and USACE.

Figure 1 –Factors of Safety at Cane Run Impoundments



Thank you for the opportunity to comment. If you have any questions regarding these comments, please contact me using the information provided below.

Thank you,

David J. Millay

David Millay, PE
Civil Engineer
502-627-2468
david.millay@eon-us.com

Attachments

Cc: James Kohler, P.E. U.S. Environmental Protection Agency
Brian Scott Phelps, P.E., Kentucky Department of Environmental Protection
John Voyles, E.ON U.S.
Michael Winkler, E.ON U.S.

<u>Attachment 1 –LG&E Comments</u>

DRAFT Assessment of Dam Safety, Coal Combustion Waste Impoundment (Task 3) Report,

Cane Run Power Station,

Prepared by CHA,

December 18, 2009

Note: LG&E considers each impoundment as an individual facility, because each impoundment has a unique purpose.

- Ash Treatment Basin
- E Pond
- Basin Pond
- Dead Storage Pond

Page 1, section *1.1 INTRODUCTION*
First paragraph, last sentence:

Note: Cane Run is not shown in Figure 1. The arrow on map is pointing to a different power station.

Page 1, section *Company or Organization Name, Name & Title*
Changes to be made only to the following names:

~~E.ON U.S.(~~Louisville Gas & Electric~~)~~	Steve Turner, General Manager
~~E.ON U.S.(~~Louisville Gas & Electric~~)~~	Kevin Shaughnessy, Production Leader
E.ON U.S. ~~(Louisville Gas & Electric)~~	Mike Winkler, Manager Environmental Programs
E.ON U.S. ~~(Louisville Gas & Electric)~~	David Millay, P.E., Civil Engineer – Generation Engineering
~~E.ON U.S.(~~Louisville Gas & Electric~~)~~	Michael Hensley, Production Manager

Page 3, section *1.3 Site Description and Location*
First, second and fourth bullet:

- (second sentence) "This basin includes the E-Pond which receives landfill run-off where ~~entrains~~ entrained solids settle before the water flows into the ATB."
- (third sentence) "Excess water is pumped to the ~~Clearwater~~ Clearwell Pond."
- "~~Clearwater~~ Clearwell Pond serves to settle suspended solids prior to limited reuse by FGD systems or discharge to the site ATB."

Page 3, section *1.3 Site Description and Location*
Second paragraph, third sentence:
"While the ~~Clearwater~~ Clearwell Pond has the potential to receive CCW…"

Page 4, section *1.3.1 Ash Treatment Basin and E-Pond*
First paragraph, fourth sentence:
"The ATB was expanded in 1977 and reportedly contains bottom ash, fly ash, ~~boiler slag~~ and other materials…"

Note: The definition of Boiler Slag from the American Association of Coal Ash is as follows: *a molten ash collected at the base of slag tap and cyclone furnaces that is quenched with water and shatters into black, angular particles having a smooth, glassy appearance. Boiler slag is in high demand for beneficial use (blasting grit, roofing granules, etc.), but supplies are decreasing because of the removal from service of power plants (due to their age) that produce boiler slag.*

Cane Run does not operate slag tap or cyclone furnaces.

Fourth paragraph, first sentence:
"An Emergency Sludge Pond (or E-Pond), approximately_1.5 acres, was proposed…"
(Enter space in between approximately and 1.5 acres)

Note: The E-Pond is used as secondary (back-up) storage for the sludge processing plant located approximately 200 ft. to the west of the E-Pond.

Page 6, section *1.3.3 Other Impoundments*
First sentence:
"One additional impoundment, the ~~*Clearwater*~~ Clearwell Pond, potentially contains Coal Combustion Byproducts."

Page 7, section *1.5 site Geology*
Second paragraph, first sentence:
Note: Figure 6 is not a map showing Cane Run.

Page 9, *Figure 1 Project Location Map*

Note: Cane Run is not shown in Figure 1. The arrow on map is pointing to a different power station.

Page 10, *Figure 2 Photo Site Plan*

Note: Change note for Clearwell Pond from "Clean Water" to "Clearwell Pond"

Page 14, *REGIONAL GEOLOGY, CANE RUN POWER STATION, LOUISVILLE, KENTUCKY*
Note: Cane Run Station is not shown in Figure 1.

Page 15, footer, fourth line down:
"~~*Kentucky Utilities*~~ Louisville Gas and Electric"

Page 16, section *2.2.1.14 ATB North Dike*
Thirteenth sentence:
"According to E.ON U.S., sod was used to avoid the difficulty of establishing grass on the slope from seed during the rainy ~~*summer*~~ fall season."

Page 19, section *2.3.2 Basin / Dead Storage Pond Complex Control Structure and Discharge Channel*
Second sentence:
"These ponds drain into the incised ~~*Clearwater*~~ Clearwell Pond (Photo 56), where water is re-used for plant processes."

Page 19, section *2.4 Monitoring Instrumentation*

Note: Six (6) piezometers were installed in the ATB in January and February of 2010. There is an electronic flow meter at the discharge of the ATB.

Page 22 & 23, *Photos 3-6*

Note: Drainage improvements were constructed in November of 2010 and water now drains away from the downstream toe of the north embankment of the ATB.

Page 29, caption below *Photo 18*

Third sentence:

"Drainage swale between dike and railroad tracks was cleaned out of sediment and debris in the ~~*summer*~~ fall of 2009."

Page 35, *Photo 30*

Note: The downstream slope is 2 Horizontal : 1 Vertical according to a field survey conducted in January 2010.

Page 37, caption below *Photo 34*

First sentence:

"ATB discharge to ~~*NPDES*~~ KYPDES permitted outfall."

Page 39, *Photo 38*

Note: The downstream embankment slope ranges from 1.7 Horizontal : to 1 Vertical to 2.8 Horizontal : 1 Vertical, flattening from the crest to the toe.

Page 40, *Photos 39 and 40*

Note: Change E.ON U.S. to LG&E

Page 48, caption below *Photo 56*

"~~*Clearwater*~~ Clearwell Pond west of Basin/Dead Storage Pond is incised."

Page 49, footer, fourth line down:

"~~*Kentucky Utilities*~~ Louisville Gas and Electric"

Page 50, footer, fourth line down:

"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 51, section *3.3.1 Stability Analyses of Former Ash Pond*

Third paragraph, last sentence:

"The computed factors of safety for the downstream side of the west dike are summarized in ~~*Table 6*~~ Table 3."

Page 51, footer, fourth line down:

"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 52, section *3.3.2 Stability Analysis of Existing Ponds*

Note: Geology map shown in Figure 6 does not include Cane Run Power Station.

Page 52, section *3.4.1 Geotechnical Reports*

First paragraph, first sentence:

"In 1976, LG&E retained ATEC Associates to conduct a stability analysis on the ash pond. ATEC Associates advanced 4 borings ~~*in 1976*~~ as part of ~~*their*~~ a subsurface exploration and stability assessment…"

Second paragraph, first sentence:

"We understand that geotechnical explorations ~~*have not been advanced*~~ within the existing ATB, Basin Pond, or Dead Storage Pond for embankment design or since construction."

Note: MACTEC Consulting and Engineering conducted a geotechnical exploration in January 2010.

Page 52, footer, fourth line down:

"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 53, section *3.5 Operations & Maintenance*

Additional sentence placed at the end of first paragraph: "LG&E completed an Emergency Action Plan for the ATB in January of 2010."

Page 53, footer, fourth line down:

"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 54, section *3.6.2 Inspections by Engineering Consultants*

First paragraph, first sentence:

"~~*E.ON U.S.*~~ LG&E hired a ~~*consultant*~~ professional geotechnical engineering firm, ATC Associates, to perform a visual inspection…"

First bullet:

"Conduct another visual inspection of each facility during the growing season in 2009. Field work was performed in January and the ground was frozen in some cases was covered with snow."

Note: ATC Associates completed a growing season inspection in November 2009. A final report is expected by the end of the first quarter 2010.

Third bullet:

"Prepare Emergency Action Plan for each structure."

Note: LG&E C completed an Emergency Action Plan for the Cane Run ATB in January 2010.

Fourth bullet:

"Prepare or update topographical mapping of the facility."

Note: LG&E obtained a current (2008) Topographic Map from the Louisville Jefferson county Information Consortium (LOJIC) in the summer of 2009.

Sixth bullet:

(last sentence) "It was recommended that these records be maintained both at each Power Station as well as a central location such as a corporate office."

Note: Records for the Cane Run Ash Pond are maintained in an electronic record database as well as a company intranet site.

Last paragraph, first sentence:
"We understand that the ~~*consultant*~~ ATC Associates performed a follow-up visual inspection…"
Note: ATC noted no urgent items.

Page 54, section *3.6.3 Inspection by Owner Representative*
First paragraph, first sentence:
(toward end) "…assessment of the Basin Pond, Dead Storage Ponds, Emergency Pond and ~~*Clearwater*~~ Clearwell Pond on March 17, 2009."

Page 54, footer, fourth line down:
"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 55, footer, fourth line down:
"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 56, footer, fourth line down:
"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 57, *CROSS SECTION OF FORMER ASH POND*
IMAGE REFERENCE:
"~~*FULLER, MOSSBARGER, SCOTT & MAY ENGINEERS INC., ASH POND PLANNING STUDY, APRIL 2008, ASH POND HYDROGRAPHIC SURVEY PLAN SHEET 1 OF 2.*~~ ATEC ASSCIATES, GEOTECHNICAL INVESTIGATION, ASH POND STABILITY, CANE RUN GENERATING STATION, LOUISVILLE GAS & ELECTRIC COMPANY, PLATE 2."

Page 58, footer, fourth, fifth and sixth line down:
"~~*Duke Energy*~~ Louisville Gas and Electric
~~*Riverbened Steam Station*~~ Cane Run Power Station
~~*Mount Holly, North Carolina*~~ Louisville, Kentucky"

Page 59, section 4.3 Basin/Dead Storage Ponds:
"As discussed in Section 3.6, ~~*E.ON U.S.*~~ LG&E has undertaken remedial measures…"

Page 59, footer, fourth line down:
"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 60, footer, fourth line down:
"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 61, footer, fourth line down:
"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Page 62, footer, fourth line down:
"~~*E-On/Louisville Gas & Light*~~ Louisville Gas and Electric"

Attachment 2 –LG&E Additional Information

Geotechnical Exploration and Slope Stability Analyses, Data Package

Louisville Gas and Electric (LG&E)

Cane Run Station

Ash Treatment Basin / E-Pond Complex,

MACTEC Engineering and Consulting,

February 23, 2010

GEOTECHNICAL EXPLORATION AND SLOPE STABILITY ANALYSES DATA PACKAGE

LOUISVILLE GAS AND ELECTRIC (LG&E) CANE RUN STATION ASH TREATMENT BASIN / E-POND COMPLEX LOUISVILLE, KENTUCKY

February 23, 2010

Prepared For:

E. ON U.S. Services, Inc.
220 West Main Street
Louisville, Kentucky 40202

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC.
13425 Eastpointe Centre Drive, Suite 122
Louisville, Kentucky 40222

MACTEC PROJECT 3143-10-1216

MACTEC

February 23, 2010

Mr. David J. Millay, P.E.
E. ON U.S. Services, Inc.
220 West Main Street
Louisville, Kentucky 40202
Phone: 502-627-2468
Facsimile: 502-217-2850
Electronic mail: David.Millay@eon-us.com

**SUBJECT: Geotechnical Exploration and Slope Stability Analyses Data Package
LG&E Cane Run Station – Ash Treatment Basin / E-Pond Complex
Louisville, Jefferson County, Kentucky
MACTEC Project Number 3143-10-1216**

Dear Mr. Millay:

MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit this data package summarizing our geotechnical exploration and slope stability analyses completed to date for the Ash Treatment Basis / E-Pond Complex at the LG&E Cane Run Station Facility in Louisville, Jefferson County, Kentucky. Our services were provided in general accordance with our Master Agreement Number 31528, Contract Number 41994 and our Proposal Number PROP10LVLE Task 006R, dated February 4, 2010.

The attached data package presents a brief discussion of our scope of geotechnical services, results of our field and laboratory testing and the results of our slope stability analyses performed to date. A final report of our geotechnical exploration and slope stability analyses for this facility will be issued under separate cover.

MACTEC appreciates this opportunity to provide our services to you and we look forward to serving as your geotechnical consultant throughout this project. Please contact us if you have any questions regarding the information presented.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

April L. Brenneman, P.E.
Project Engineer
Licensed Kentucky 26750

Nicholas G. Schmitt, P.E.
Senior Principal Engineer
Licensed Kentucky 10311

Attachment: Data Package

EXECUTIVE SUMMARY

The firm of CHA was contracted by Lockheed Martin (a contractor of the United States Environmental Protection Agency) to perform a site assessment of the coal combustion waste (CCW) impoundments at the Louisville Gas and Electric (LG&E) Cane Run Station Facility. CHA issued a *Draft Report of Assessment of Dam Safety*, for these facilities on December 18, 2009. LG&E retained MACTEC Engineering and Consulting, Inc. (MACTEC) to provide geotechnical engineering consulting services and to conduct geotechnical explorations and slope stability analyses on the Ash Treatment Basin (ATB)/Emergency Pond (E-Pond) Complex and the Dead Storage/Basin Pond Complex. This document presents a high level summary of our activities, findings and conclusions to date, for the ATB/E-Pond Complex. The Dead Storage/Basin Pond Complex activities are reported under separate cover.

Background

The ATB/E-Pond Complex has a surface area of approximately 52.3 acres, impounds bottom ash, fly ash and other materials including coal fines, process water drainage and treated sanitary wastewater. The ATB impoundment is partially incised and partially diked, with approximately 750 linear feet of the northwest portion fully incised and the remainder (approximately 4,500 linear feet) a combination of incised and diked. The typical crest elevation is 460 feet National Geodetic Vertical Datum of 1929 (NGVD) with a typical crest width of 15 feet. The bottom of pond elevation is 420 feet NGVD. The original ground surface elevation was reported to vary from 450 feet NGVD (near the diked portion of the pond) to 460 feet NGVD (near the incised portion of the pond). The downstream toe elevation varies with the lowest toe elevation of 446 feet NGVD resulting in a maximum dam height of approximately 14 feet. The maximum operating pool elevation is 456.5 feet NGVD (maximum pond depth of 36.5 feet). The downstream slope faces are nominally 3H:1V (horizontal to vertical) and the upstream slopes (wet side) are nominally 1.5H:1V.

The 1.5 acre E-Pond is located within the southwest corner of the ATB and was reportedly designed with 1.5H:1V interior and exterior slopes. CHA reported that about one-third to one-half of the ATB/E-Pond Complex no longer retains open water. Stockpiled materials consisting of clay and topsoil, were observed in the southwest corner of the ATB, east of the E-Pond, potentially applying a surcharge load to the south dike.

Engineering Approach

MACTEC's engineering approach is based on 1) a systematic process of obtaining and reviewing available data; 2) developing an exploration approach to efficiently obtain missing data that is required to evaluate the stability of the structure and 3) assigning a project team with all the requisite technical skills and experience necessary to fully evaluate the existing impoundment conditions, competency and stability.

MACTEC assembled a geotechnical engineering team that met with LG&E representatives to outline our engineering approach and geotechnical exploration. We reviewed the *Draft Report* *of Assessment of Dam Safety,* reviewed aerial photographs, site photographs from time of construction, reviewed various previous studies and Kentucky Division of Water inspection reports, conducted a site reconnaissance, and received a copy of a design drawing. We also interviewed the retired LG&E engineer who was responsible for the impoundment design and construction oversight. MACTEC developed a geotechnical exploratory drilling program, a geotechnical laboratory testing program and determined supplemental surveying requirements. The primary guidance documents for the development of our exploration and analyses included: Kentucky Environment and Energy Cabinet, Water Infrastructure Branch, Dam Safety Division Guidelines (primarily Engineering Memorandum Number 5 and KAR 401:030 – Design Criteria for Dams and Associated Structures and "Guidelines for Geotechnical Investigation and Analysis of New and Existing Earth Dams") and the U.S. Army Corps of Engineers Engineering Manual (USACE) EM 1110-2-1902. These guidance documents suggest a Factor of Safety (FOS) of 1.5 for long-term, steady-state conditions using maximum storage pool (EM 1110-2-1902 suggests an FOS of 1.4 for long-term, steady-state conditions using maximum surcharge pool); an FOS of 1.2 for rapid drawdown (EM 1110-2-1902 suggests an FOS in the range of 1.1-1.3); and an FOS of 1.0 for seismic conditions.

Exploration and Laboratory Testing Program

The geotechnical exploration program was developed to obtain subsurface data at nine cross-sections along the dam at areas we judged to be "critical" based on the topography and nature of the exposed slope. Another cross-section was added to obtain additional subsurface and slope geometry information at the eastern corner of the pond. A total of ten soil test borings were drilled along the embankment crest, extending to depths of up to 50 feet, and a total nine soil test borings were drilled along the toe of the embankment to depths of up to 25 feet. Two borings were drilled in the stockpile area to a depth of 65 feet. A total of four piezometers were installed along the embankment crest and two piezometers were installed in the toe borings to monitor pieziometric levels within the dam.

The geotechnical laboratory testing program consisted of extensive classification tests, including Atterberg Limits, Grain-size analyses and specific gravity determinations; and strength tests including consolidated undrained triaxial shear tests with pore pressure monitoring and direct shear tests, to determine both total stress and effective stress parameters. In addition to this laboratory testing program, the Standard Penetration Test results obtained during drilling were statistically analyzed to delineate the general subsurface conditions.

Slope Stability Modeling and Analyses

Slope stability analyses were conducted using the computer program PCSTABL, developed by Purdue University. The program uses a two-dimensional limit equilibrium method of analysis and calculates the factor of safety based on the Modified Bishop Method of Slices. Our analyses were performed to model the overall stability of the existing dike including steady-state, rapid drawdown and seismic (dynamic) conditions. To date, eight cross-sections (Sections 1 through 7, including Section 3.5) located along the north, east and south sides of the dike have been analyzed, the locations of which are shown on the attached Boring Location Plan and Stability Section drawing. A total of ten cross-sections will be analyzed for this pond. The results of the remaining analyses to be performed will be submitted in our final report of geotechnical exploration and slope stability analyses.

The geometry used in the analyses of the ATB / E-Pond Complex were based on 1) a construction drawing entitled "Ash Pond Addition – 1972" by LG&E Construction Department; 2) the "Ash Pond Hydrographic Survey and Isopach Plans, Sheet 1 and 2" dated April 2008, provided by Fuller, Mossbarger, Scott and May Engineers (Stantec, Inc.); and 3) a topographic survey of the boring locations and cross-sections provided by HDR in January 2010.

The upstream slopes for Section 1 through 7 (including Section 3.5) were observed to range from 1.3H:1.V to 1.9H:1V and the downstream slopes ranged from 2.4H:1V to 5.3H:1V. The upstream slopes below the current water or ash levels were projected from the topographic data obtained in the field at each cross-section location from the portion of the upstream slope above the water/CCW level. Slopes used for each section model are summarized in a table submitted with this data package.

In general, the dike was constructed of clay fill reportedly excavated from the incised portion of the pond. The clay fill was placed overlying existing alluvial soils comprised of clay overlying sandy soils. Soil parameters (shown in Table 1 below) selected for the slope stability analyses were chosen based on various resources including the results of the extensive laboratory testing described above, field testing and observations, published information on similar soil types and our experience. The soil strength parameters selected for each cross-section analyzed are shown on the PCSTABL plots submitted with this data package.

Table 1. Soil Parameters

Soil Type No.	**Soil Description**	**Unit Weight**		**Effective Stress**	
		Total (pcf)	**Saturated (pcf)**	**Cohesion C' (psf)**	**Friction Angle Φ' (degrees)**
1	CL (stiff)	132	137	750	22
2	CL (firm)	125	130	375	16
3	SC (firm)	130	135	0	32
4	SP (firm)	104	109	0	35
5	SP (loose)	91	96	0	34
6	CCW	90	95	0	30
7	CL-Stockpile	134	139	200	30

Calculated By: ALB
Checked By: CRV

Seismic conditions for this site were modeled under dynamic loading conditions using a peak ground acceleration value of 0.050g (horizontally and vertically) for a 2 percent probability of exceedance in 50 years.

The maximum operating pool for the ATB / E-Pond Complex is 456.5 feet NGVD. The maximum surcharge pool (crest of dam) was used in our analyses (ranging from 457.8 to 460.3 feet NGVD). The unit weight of water contained within the pond was modeled as 62.4 pounds per cubic foot (pcf). Further, we used water level readings obtained from the piezometers installed in the crest and toe borings and modeled piezometric surfaces that extended across the pond through the embankments to simulate a "worst case" condition. Water levels in the installed piezometers are shown on the attached boring logs. The hydrographic survey and isopach plans provided by Stantec were used to conservatively model the amount of CCW in the ash pond.

Conclusions and Recommendations

The results of the analyses for each critical-section selected are summarized in the Factor of Safety (FOS) Summary Tables included as an attachment to this data package. In addition, the PCSTABL Plots showing the models and failure circles are also attached. Based on the guidance documents previously referenced, a slope stability target FOS for dam embankments of 1.5 is recommended for long-term, steady-state (effective stress) stability; an FOS of 1.4 is recommended for maximum surcharge pool (effective stress) conditions; an FOS of 1.2 is recommended for rapid draw-down (effective stress) conditions and an FOS of 1.0 is recommended for seismic (dynamic) loading (effective stress) conditions. Our analysis, performed using the parameters and geometry described above, indicates that the cross-sections analyzed to date provide acceptable factors of safety according to the criteria described herein.

The lowest factors of safety were observed in the Section 1, upstream, rapid drawdown model and the Section 4, upstream models for all three cases (steady-state, rapid drawdown and seismic conditions). These models had the lowest factors of safety indicating they are the most critical cross-sections, yet they still met regulatory guidelines. The Section 1, upstream model indicated a FOS of 1.21 for rapid drawdown conditions. Based on the geometry, Section 1 exhibits a slightly steeper upstream slope (1.4H:1V) and is near the area of the pond containing the least amount (lowest elevation) of CCW. The weight of the CCW acts as a counterweight to the driving force of the slope. Thus, decreasing the amount of ash in this area of the north slope (such as in dredging activities) could further decrease the FOS. The critical elevation in which CCW is needed to maintain an acceptable FOS will be provided in our final report of geotechnical exploration and slope stability analyses.

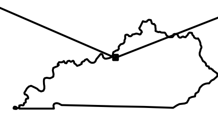
Section 4, upstream models indicated an FOS of 2.4 for steady-state, 2.6 for maximum surcharge, 1.5 for rapid drawdown and 2.1 for seismic conditions. Based on the geometry, Section 4 also exhibits a slightly steeper upstream slope (1.3H:1V) which contributes to the cause of lower factors of safety relative to those observed in the remaining models for the ATB / E-Pond Complex.

The CHA report expressed concerns that the stockpiled material was placing a surcharge load on the dike, making this a critical section for modeling purposes. Based on the results of the downstream modeling and analyses, the surcharge load from the stockpiled materials is not significant to the slope stability of the impoundment. Factors of safety of 3.0 and above were obtained thus Section 7 does not appear to be a critical cross-section. Upstream analyses were not performed for Section 7 due to the presence of the stockpiled material.

MACTEC has completed laboratory analyses on selected material collected during field explorations. Based in our initial review of the data, the material properties and embankment characteristics, it is expected that further analysis will result in factors of safety that meet regulatory guidelines. We will continue slope stability analyses efforts for the ATB / E-Pond Complex and will revise analyses and identify critical cross-sections as necessary. The results of these engineering analyses and a detailed report of our geotechnical exploration will be provided in our final report.

SITE LOCATION MAP

SOURCE: CaneRunA.tif, based on Aerial Survey performed by L. Robert Kimball Associates on December 21, 2009



LOUISVILLE GAS & ELECTRIC
220 WEST MAIN STREET
LOUISVILLE, KENTUCKY

PROJECT NO. 3143-10-1216

MACTEC
13425 Eastpoint Centre Drive, Ste 122
Louisville, KY. 40223
Phone: 502-253-2500 Fax: 502-253-2501

CHECKED BY: A.BRENNEMAN PREPARED BY: G.HAYS

SITE LOCATION MAP
LG&E CANE RUN POWER STATION
LOUISVILLE, KENTUCKY

CADD FILE: 101216_SLM.dwg
PLOT DATE: 2/8/10

FIGURE 1

BORING LOCATION PLAN AND SLOPE STABILITY SECTIONS

Source: Louisville/Jefferson County Information Consortium (lojic), Boring Locations and Sections provided by HDR.

REV	DATE	BY	DESCRIPTION

SEAL

DESIGNED A.BRENNEMAN
DRAWN G.HAYS
CHECKED A.BRENNEMAN
IN CHARGE C.VANCE
DATE 2/17/10

LOUISVILLE GAS & ELECTRIC
220 WEST MAIN STREET
LOUISVILLE, KENTUCKY

MACTEC
13425 Eastpoint Centre Drive, Ste 122
Louisville, KY. 40223
Phone: 502-253-2500 Fax: 502-253-2501

BORING LOCATION PLAN AND
SLOPE STABILITY SECTIONS
ASH TREATMENT BASIN/E-POND COMPLEX
LG&E CANE RUN POWER STATION
LOUISVILLE, KENTUCKY

SCALE 1"=100'
MACTEC PROJECT NO. 3143-10-1216
DWG. NO. 2
CADD FILE: 101216 BLP.dwg
PLOT DATE: 2/17/10

KEY TO SYMBOLS AND DESCRIPTIONS

LOGS OF BORINGS

STATISTICAL ANALYSIS OF SPT RESISTANCES

MACTEC KEY TO SYMBOLS AND DESCRIPTIONS

Group Symbols	Typical Names
GW	Well graded gravels, gravel - sand mixtures, little or no fines.
GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.
GM	Silty gravels, gravel - sand - silt mixtures.
GC	Clayey gravels, gravel - sand - clay mixtures.
SW	Well graded sands, gravelly sands, little or no fines.
SP	Poorly graded sands or gravelly sands, little or no fines.
SM	Silty sands, sand - silt mixtures
SC	Clayey sands, sand - clay mixtures.
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts and with slight plasticity.
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
OL	Organic silts and organic silty clays of low plasticity.
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
CH	Inorganic clays of high plasticity, fat clays
CL-CH	Inorganic clays ranging from low to high plasticity (combination of CL and CH above)
OH	Organic clays of medium to high plasticity
PT	Peat and other highly organic soils.
Top-Soil	The upper portion of a soil, usually dark colored and rich in organic material.
FILL	Fill soils are materials that have been transported to their present location by man.
Lime-stone	A sedimentary rock consisting predominantly of calcium carbonate
Sand-stone	A sedimentary rock consisting of sand consolidated with some cement (clay or quartz etc.)
Silt-stone	A fine-grained rock of consolidated silt.
Shale	A fine-grained sedimentary rock consisting of compacted and hardened clay, silt, or mud.
PWR	Partially Weathered Rock

Boundary Classifications:
Soils possessing characteristics of two groups are designated by combinations of group symbols.

Undisturbed Sample (UD or SH)	Auger Cuttings (AU)
Split Spoon Sample (SS or SPT)	Bulk Sample (BK) or Grab Sample (GS)
Rock Core (RC)	No Recovery (NR)
Water Table at time of drilling	Water Table after drilling
WOH - Weight of Hammer	C Cave Depth

Correlation of Penetration Resistance (N) with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
Relative Density	No. of Blows	Consistency	No. of Blows
Very Loose	0 to 4	Very Soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Firm	11 to 20	Firm	5 to 8
Very Firm	21 to 30	Stiff	9 to 15
Dense	31 to 50	Very Stiff	16 to 30
Very Dense	Over 50	Hard	Over 30

Standard Penetration Resistance The Number of Blows of a 140 lb. Hammer Falling 30 in. Required to Drive a 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586. Also commonly referred to as an "N" value.

Estimated Relative Moisture Condition

Visual classification relative to assumed optimum moisture content (OMC) of standard proctor

Dry:	Air dry to dusty
Slightly Moist:	Dusty to approximately -2% OMC
Moist:	Approximately between ±2% OMC
Very Moist:	From approximately +2% to nearly saturated
Wet:	Contains free water or nearly saturated

Relative Hardness of Rock

Very Soft:	Can be broken with fingers
Soft:	Can be scratched with fingernail; Only edges can be broken with fingers
Moderately Hard:	Can be easily scratched with knife; Cannot be scratched with fingernail
Hard:	Difficult to scratch with knife; Hard hammer blow to break specimen
Very Hard:	Cannot be scratched with knife; Several hard hammer blows to break specimen

Rock Continuity

Core Recovery	Description
0 - 40%	Incompetent
40 - 70%	Competent
70 - 90%	Fairly Continuous
90 - 100%	Continuous

Rock Quality Designation

RQD	Rock Quality Classification
< 25%	Very Poor
25 - 50%	Poor
50 - 75%	Fair
75 - 90%	Good
90 - 100%	Very Good

REC Recovery - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%

RQD Rock Quality Designation - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV MSL (ft)	SAMPLES: Sample Number	Sample Type	RECOV (in.)	N-COUNT (1st 6" 2nd 6" 3rd 6") / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS **Note:** *No information on the borings should be used without considering the entire content of the main document.*
0	GRAVEL with fine to coarse SAND, with organics, moist; FILL		459.3	SS-1		12	7-5-6 (N = 11)	17.8					SURFACE COVER: GRAVEL & GRASS
	STIFF, Dark orange brown, brown and light gray, silty and sandy, lean CLAY (CL), with trace organics, moist; FILL												
5			454.3	SS-2		16	4-5-7 (N = 12)	22.0					
	STIFF, Light gray, silty and sandy, lean CLAY (CL), with trace organics, moist; FILL												
10			449.3	SS-3		15	3-4-7 (N = 11)	20.8					
				UD-1		24		16.3	33	20			
	FIRM, Tan and light gray-brown, silty, lean CLAY (CL), with black oxides, moist; ALLUVIUM			SS-4		16	3-4-3 (N = 7)	21.7					
15			444.3										
	FIRM, Dark reddish brown, very fine to fine grained, clayey SAND (SC), moist; ALLUVIUM			SS-5		18	4-6-7 (N = 13)	18.8					
20			439.3										
	LOOSE, Orange-brown and tan, very fine to fine grained, poorly graded SAND (SP), moist; ALLUVIUM			SS-6		18	5-5-5 (N = 10)	7.4					
25			434.3	UD-2		21							PZ INSTALLED WITH SCREENED INTERVAL FROM 25.0-35.0 FEET; 1/29/2010 DRY 2/1/2010 DRY 2/12/2010 DRY
				SS-7		18	3-3-4 (N = 7)	8.6					
30			429.3										
				SS-8		16	3-5-5 (N = 10)	6.2					
35			424.3										
				SS-9		14	3-3-5 (N = 8)	5.8					
40			419.3	UD-3		20							
				SS-10		16	3-4-5 (N = 9)	6.7					
45	LOOSE, Orange-brown and tan, medium to coarse grained, poorly graded SAND (SP), with pebbles, moist; ALLUVIUM		414.3										
				SS-11		18	3-4-6 (N = 10)	8.8					
50	BORING TERMINATED AT 50.0 FEET		409.3										BORING DRY UPON COMPLETION OF DRILLING
55			404.3										

START DATE: 1/22/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: ~~~~~~~~~~~~ **Boring No.: B-1C**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS Note: *No information on the borings should be used without considering the entire content of the main document.*
0	Gravel (Crushed Stone); FILL	452.5										SURFACE COVER: GRAVEL
	STIFF, Dark brown and gray, lean CLAY (CL), moist; ALLUVIUM		SS-1		18	3-5-4 (N = 9)						
5		447.5	SS-2		16	3-4-5 (N = 9)	27.9					
	VERY STIFF, Light brown and gray, sandy, lean CLAY (CL), moist; ALLUVIUM		UD-1		22							
10		442.5	SS-3		18	7-8-11 (N = 19)	21.3					
			UD-2		20		22.0	41	19		87	
	FIRM, Light brown, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM		SS-4		16	4-5-6 (N = 11)	6.4					BORING CAVED IN AT A DEPTH OF 15.2 FEET UPON COMPLETION OF DRILLING
15	C	437.5	UD-3		20							
	LOOSE, Light brown, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM		SS-5		18	3-3-3 (N = 6)	8.4					
20	BORING TERMINATED AT 20.0 FEET	432.5										BORING DRY UPON COMPLETION OF DRILLING
25		427.5										
30		422.5										
35		417.5										
40		412.5										
45		407.5										
50		402.5										
55		397.5										

START DATE: 1/25/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: AG **Boring No.: B-1T**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

TEST BORING RECORD

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	DESCRIPTION	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT (1st 6" 2nd 6" 3rd 6") / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS
0	Poorly graded GRAVEL with fine to coarse SAND, with organics, moist; FILL	460.3	SS-1	SS	15	5-5-7 (N = 12)	19.0					SURFACE COVER: GRAVEL & GRASS
	STIFF, Brown, orange brown and gray, sandy, lean CLAY (CL), with trace organics, moist; FILL		SS-2	SS	18	5-5-6 (N = 11)						
5		455.3	UD-1	UD	24		14.5	41	22			
10		450.3	SS-3	SS	16	4-6-9 (N = 15)						
	STIFF, Gray, lean CLAY (CL), with trace organics, moist; ALLUVIUM		SS-4	SS	18	4-4-5 (N = 9)						
15		445.3	UD-2	UD	24		19.9	39	21			
	FIRM, Dark reddish brown, clayey SAND (SC), moist; ALLUVIUM		SS-5	SS	18	3-5-7 (N = 12)						
20		440.3										
	LOOSE, Brown, tan and gray, very fine to fine grained, poorly graded SAND (SP), with fine gravel, moist; ALLUVIUM		SS-6	SS	18	3-3-4 (N = 7)	12.0					
25		435.3										
			SS-7	SS	18	3-3-5 (N = 8)						
30		430.3	UD-3	UD	24		5.6				2	
			SS-8	SS	15	3-4-5 (N = 9)						
35		425.3										
			SS-9	SS	16	3-4-5 (N = 9)	5.0					
40		420.3										
	FIRM, Brown, tan and gray, very fine to fine grained, poorly graded SAND (SP), with coarse sand and pebbles, moist; ALLUVIUM		SS-10	SS	15	3-5-6 (N = 11)	4.9					BORING CAVED IN AT A DEPTH OF 45.0 FEET UPON COMPLETION OF DRILLING
45	C	415.3										
			SS-11	SS	15	3-6-8 (N = 14)	3.9				4	
50	BORING TERMINATED AT 50.0 FEET	410.3										BORING DRY UPON COMPLETION OF DRILLING
55		405.3										

Note: No information on the borings should be used without considering the entire content of the main document.

START DATE: 1/21/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [illegible]
Boring No.: B-2C

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil, psi-rock)	Percent Passing #200 Sieve	REMARKS Note: No information on the borings should be used without considering the entire content of the main document.
0	Gravel (Crushed Stone); FILL		448.5										SURFACE COVER: GRAVEL
	STIFF, Brown and gray, lean CLAY (CL), moist; ALLUVIUM			SS-1		18	2-4-6 (N = 10)						
5			443.5	SS-2		18	2-5-9 (N = 14)	18.6					
	VERY STIFF, Gray with brown, lean CLAY (CL), moist; ALLUVIUM												
10	FIRM, Red brown, clayey SAND (SC), fine to medium grained, moist; ALLUVIUM		438.5	SS-3		18	4-6-10 (N = 16)	21.9					
	FIRM, Brown and light brown, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM												
15		C	433.5	SS-4		18	6-6-10 (N = 16)	15.0					BORING CAVED IN AT A DEPTH OF 14.7 FEET UPON COMPLETION OF DRILLING
20	BORING TERMINATED AT 20.0 FEET		428.5	SS-5		18	6-6-10 (N = 16)	6.2					BORING DRY UPON COMPLETION OF DRILLING
25			423.5										
30			418.5										
35			413.5										
40			408.5										
45			403.5										
50			398.5										
55			393.5										

START DATE: 1/24/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature] Boring No.: **B-2T**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

TEST BORING RECORD

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	GRAVEL with fine to coarse SAND, with organics, moist; FILL	460.1	SS-1	15	5-4-4 (N = 8)	15.8					SURFACE COVER: GRAVEL
	FIRM to STIFF, Brown, gray-brown and dark orange-brown, silty and sandy, lean CLAY (CL), with organics and black oxides, moist; FILL										
5		455.1	SS-2	18	5-5-8 (N = 13)	16.1					
	FIRM, Gray and gray-brown, silty and sandy, lean CLAY (CL), with organics and black oxides, moist; FILL										
10		450.1	SS-3	16	3-4-5 (N = 9)	23.2					
	FIRM, Gray and gray-brown, silty and sandy, lean CLAY (CL), with organics and black oxides, moist; ALLUVIUM										
15		445.1	SS-4	15	3-3-5 (N = 8)						
			UD-1	24		19.9	37	20		83	
	LOOSE, Orange-brown, fine grained, clayey SAND (SC), moist; ALLUVIUM										
	LOOSE, Brown and tan, very fine to fine grained, poorly graded SAND (SP), moist; ALLUVIUM		SS-5	18	4-5-3 (N = 8)						
20		440.1									
25		435.1	SS-6	17	4-4-5 (N = 9)	7.7					
	FIRM to LOOSE, Brown and tan, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM										
30		430.1	SS-7	15	3-6-6 (N = 12)	5.9					
			UD-2	17							
35		425.1	SS-8	12	4-4-6 (N = 10)	5.5					
	LOOSE to FIRM, Brown and tan, fine to coarse, poorly graded SAND (SP), moist; ALLUVIUM										
40		420.1	SS-9	13	3-5-5 (N = 10)	5.8					
45		415.1	SS-10	18	7-5-7 (N = 12)	5.9					
			UD-3	22							
50		410.1	SS-11	15	7-8-8 (N = 16)	4.8					
	BORING TERMINATED AT 50.0 FEET										BORING DRY UPON COMPLETION OF DRILLING
55		405.1									

START DATE: 1/22/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature] **Boring No.: B-3C**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT (1st 6" 2nd 6" 3rd 6") RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: *No information on the borings should be used without considering the entire content of the main document.*)
0	Gravel (Crushed Stone); FILL		448.1										SURFACE COVER: GRAVEL
	STIFF to FIRM, Brown and gray, lean CLAY (CL), with trace oxides, moist; ALLUVIUM			SS-1		18	3-4-5 (N = 9)						
				SS-2		18	3-3-3 (N = 6)	32.3					
5			443.1										
				UD-1		24		21.0	32	17			
10	LOOSE, Brown with gray, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM		438.1	SS-3		18	5-5-3 (N = 8)	22.3					
				UD-2		24		19.9				20	
15			433.1	SS-4		18	3-4-6 (N = 10)	7.6					BORING CAVED IN AT A DEPTH OF 16.3 FEET UPON COMPLETION OF DRILLING
		C		UD-3		24							
	FIRM, Brown with gray, fine to medium grained, poorly graded SAND (SP), with black striations, moist; ALLUVIUM			SS-5		18	4-4-7 (N = 11)	6.1					
20	BORING TERMINATED AT 20.0 FEET		428.1										BORING DRY UPON COMPLETION OF DRILLING
25			423.1										
30			418.1										
35			413.1										
40			408.1										
45			403.1										
50			398.1										
55			393.1										

START DATE: 1/25/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature] **Boring No.: B-3T**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT (1st 6" 2nd 6" 3rd 6") RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS **Note:** *No information on the borings should be used without considering the entire content of the main document.*
0	GRAVEL with fine to coarse SAND, with organics, moist; FILL VERY STIFF, Brown and gray, lean CLAY (CL), trace organics, moist; FILL		459.2	SS-1		18	9-11-13 (N = 24)						SURFACE COVER: GRAVEL AND SOIL
	STIFF, Brown and gray, lean CLAY (CL), trace sand, moist; FILL			SS-2		18	5-6-7 (N = 13)						
5			454.2										
				SS-3		18	4-3-5 (N = 8)						HIGHER N-VALUE IN SS-1 MAY BE DUE TO THE PRESENCE OF GRAVEL IN SPLIT SPOON
10	FIRM to STIFF, Mottled brown and gray, lean CLAY (CL) moist; ALLUVIUM		449.2										
				SS-4		18	4-6-8 (N = 14)						
15			444.2										
	LOOSE, Brown and light gray brown, fine to medium grained, poorly graded SAND (SP), trace fines, with seams of clayey SAND (SC), moist; ALLUVIUM			SS-5		18	4-5-5 (N = 10)						
20	LOOSE to FIRM, Brown and light gray brown, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM		439.2	UD-1		24							
				SS-6		18	4-5-5 (N = 10)						
25			434.2										
		C		SS-7		18	4-4-7 (N = 11)						BORING CAVED IN AT A DEPTH OF 29.0 FEET UPON COMPELTION OF DRILLING
30			429.2										
	LOOSE, Light brown and tan, fine to coarse grained, poorly graded SAND (SP), with gravel, moist; ALLUVIUM			SS-8		18	2-2-3 (N = 5)						
35			424.2										
				SS-9		18	6-4-6 (N = 10)						
40			419.2										
	FIRM, Light brown and tan, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM			SS-10		18	13-6-8 (N = 14)						
45			414.2										
				SS-11		18	8-4-7 (N = 11)						
50	FIRM, Brown, fine to medium grained, poorly graded GRAVEL (GP), moist; ALLUVIUM BORING TERMINATED AT 50.0 FEET		409.2										BORING DRY UPON COMPLETION OF DRILLING
55			404.2										

START DATE: 2/2/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 75
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature] **Boring No.: B-3.5C**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psi-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	TOPSOIL; FILL	448.8	SS-1		18	2-2-3 (N = 5)						SURFACE COVER: GRASS
	FIRM, Brown and dark brown, silty, lean CLAY (CL), trace organics and sand, moist; FILL											
	STIFF, Brown and gray, lean CLAY (CL), moist; ALLUVIUM		SS-2		18	3-5-8 (N = 13)						
5		443.8	UD-1		24							
	LOOSE to FIRM, Brown and tan, fine to medium grained, poorly graded SAND (SP), with seams of clayey SAND (SC), moist; ALLUVIUM		SS-3		18	3-5-4 (N = 9)						BORING CAVED IN AT A DEPTH OF 9.0 FEET UPON COMPLETION OF DRILLING
10		438.8										
			SS-4		18	4-5-9 (N = 14)						
15		433.8										
	LOOSE, Light brown and tan, fine to coarse grained, poorly graded SAND (SP), moist; ALLUVIUM		SS-5		18	4-4-6 (N = 10)						
20	BORING TERMINATED AT 20.0 FEET	428.8										BORING DRY UPON COMPLETION OF DRILLING
25		423.8										
30		418.8										
35		413.8										
40		408.8										
45		403.8										
50		398.8										
55		393.8										

START DATE: 2/2/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 75
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature]
Boring No.: B-3.5T

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT (1st 6" / 2nd 6" / 3rd 6") RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS **Note:** *No information on the borings should be used without considering the entire content of the main document.*
0	GRAVEL with fine to coarse SAND with organics; FILL		459.6	SS-1		14	5-5-5 (N = 10)	18.9					SURFACE COVER: GRAVEL & GRASS
	STIFF, Dark orange brown, light blue-gray and gray-brown, silty, lean CLAY (CL), with trace organics and black oxides, moist; FILL												
5			454.6	SS-2		16	5-5-7 (N = 12)	16.5					
				SS-3		15	2-4-7 (N = 11)	21.5					
10	FIRM, Dark orange brown, light blue-gray and gray-brown, silty, lean CLAY (CL), with trace organics and black oxides, moist; ALLUVIUM		449.6	UD-1		24		19.3	40	18			
15			444.6	SS-4		18	3-2-4 (N = 6)	22.0					
	FIRM, Dark orange brown, very fine to fine grained, clayey SAND (SC), moist; alluvium												
20			439.6	SS-5		15	4-6-6 (N = 12)	12.6					
	FIRM, Brown, tan and light gray, very fine to fine grained, poorly graded SAND (SP), moist; ALLUVIUM												
25			434.6	SS-6		16	5-6-11 (N = 17)	5.8					
				UD-2		21		7.8				2	PZ INSTALLED WITH SCREENED INTERVAL FROM 25.0-35.0 FEET; 1/29/2010 DRY 2/1/2010 DRY 2/12/10 19.3 FEET
	LOOSE to VERY LOOSE, Brown, tan and light gray, fine to coarse grained, poorly graded SAND (SP), with pebbles, moist; ALLUVIUM												
30			429.6	SS-7		15	6-5-5 (N = 10)	5.5					
35			424.6	SS-8		15	2-2-3 (N = 5)	6.6					
40			419.6	SS-9		16	3-4-6 (N = 10)	4.3					
				UD-3		14							BORING CAVED IN AT A DEPTH OF 45.5 FEET UPON COMPLETION OF DRILLING
45		C	414.6	SS-10		14	2-2-2 (N = 4)	6.6					
50	BORING TERMINATED AT 50.0 FEET		409.6	SS-11		16	2-3-3 (N = 6)	6.0					BORING DRY UPON COMPLETION OF DRILLING
55			404.6										

START DATE: 1/23/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 4¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: JAB
Boring No.: B-4C

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	TOPSOIL; FILL	449.6	SS-1	15	3-3-4 (N = 7)	17.3					SURFACE COVER: GRASS
	FIRM to STIFF, Brown, orange-brown and blue-gray, silty, lean CLAY (CL), with organics, black oxides and trace gravel, moist; ALLUVIUM		SS-2	18	3-5-8 (N = 13)	22.1					
5		444.6									PZ INSTALLED WITH SCREENED INTERVAL FROM 10.0-20.0 FEET; 1/29/10 25.8 FEET 2/1/10 25.8 FEET 2/12/2010 DRY
	FIRM, Dark orange-brown and dark brown, clayey SAND (SC), with trace organics and black oxides, moist; ALLUVIUM		SS-3	18	4-5-7 (N = 12)	19.6					
10	FIRM, Brown and tan, very fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM	439.6									
			SS-4	13	4-7-8 (N = 15)	11.8					BORING CAVED IN AT A DEPTH OF 18.5 FEET UPON COMPLETION OF DRILLING
15		434.6									
	C		SS-5	18	5-5-9 (N = 14)	5.4					
20	BORING TERMINATED AT 20.0 FEET	429.6									BORING DRY UPON COMPLETION OF DRILLING
25		424.6									
30		419.6									
35		414.6									
40		409.6									
45		404.6									
50		399.6									
55		394.6									

START DATE: 1/23/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By:
Boring No.: B-4T

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	ELEV MSL (ft)	DESCRIPTION
0	460.0	Poorly graded GRAVEL with clay and organics; FILL
		STIFF, Orange brown and gray, silty, lean CLAY (CL), with trace organics and black oxides, moist; FILL
10	450.0	STIFF, Orange brown and gray, silty, lean CLAY (CL), with trace organics and black oxides, moist; ALLUVIUM
		LOOSE, Orange-brown, very fine to fine grained, clayey SAND (SC) with trace black oxides, moist to very moist; ALLUVIUM
		LOOSE to FIRM, Orange-brown and tan, very fine to fine grained, poorly graded SAND (SP), with trace black oxides, moist; ALLUVIUM
35	425.0	LOOSE to FIRM, Orange-brown and tan, very fine to coarse grained, poorly graded SAND (SP), moist; ALLUVIUM
50	410.0	BORING TERMINATED AT 50.0 FEET

Sample Number	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS
								Note: *No information on the borings should be used without considering the entire content of the main document.*
SS-1	18	8-5-8 (N = 13)	16.1					SURFACE COVER: GRAVEL & GRASS
SS-2	12	6-5-7 (N = 12)	17.0					
SS-3	15	3-4-9 (N = 13)	18.3					
SS-4	18	4-4-6 (N = 10)	20.9	40	22			
UD-1	15		22.9	41	21			
SS-5	15	3-3-5 (N = 8)						
SS-6	16	2-4-5 (N = 9)	13.3					
SS-7	14	3-4-7 (N = 11)	5.2					
UD-2	22							
SS-8	16	4-3-4 (N = 7)	6.1					
SS-9	13	4-4-5 (N = 9)	7.3					
SS-10	18	3-4-7 (N = 11)	3.4					BORING CAVED IN AT A DEPTH OF 47.5 FEET UPON COMPLETION OF DRILLING
UD-3	22		5.4				5	
SS-11	15	5-8-10 (N = 18)	4.1					BORING DRY UPON COMPLETION OF DRILLING

START DATE: 1/23/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [illegible]
Boring No.: B-5C

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS Note: *No information on the borings should be used without considering the entire content of the main document.*
0	TOPSOIL; FILL		450.9	SS-1		15	3-4-3 (N = 7)	29.9					SURFACE COVER: GRASS
	FIRM to STIFF, Dark brown, orange-brown and light gray, silty, lean CLAY (CL), with organics and black oxides, moist; FILL												
5			445.9	SS-2		18	3-5-6 (N = 11)	24.9					
	LOOSE, Dark orange brown and brown, very fine to fine grained, clayey SAND (SC), moist to very moist; ALLUVIUM												
10			440.9	SS-3		16	8-4-6 (N = 10)	19.6				29	
	FIRM to LOOSE, Brown and tan, very fine to coarse grained, poorly graded SAND (SP), moist to very moist; ALLUVIUM												
15			435.9	SS-4		15	3-6-6 (N = 12)	9.0					
20			430.9	SS-5		18	3-5-6 (N = 11)	4.6					BORING CAVED IN AT A DEPTH OF 22.5 FEET UPON COMPLETION OF DRILLING
		C											
25	BORING TERMINATED AT 25.0 FEET		425.9	SS-6		15	2-3-3 (N = 6)	3.9					BORING DRY UPON COMPLETION OF DRILLING
30			420.9										
35			415.9										
40			410.9										
45			405.9										
50			400.9										
55			395.9										

START DATE: 1/23/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature] **Boring No.: B-5T**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT (1st 6" 2nd 6" 3rd 6") RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	Poorly graded GRAVEL with fine to coarse SAND; FILL	458.5	SS-1	0	50/5" (N = 50/5")						SURFACE COVER: GRAVEL & GRASS
	VERY STIFF, Brown and gray-brown, silty and sandy, lean CLAY (CL), with trace black oxides, slightly moist to moist; FILL		UD-1	11		15.9	36	19			
5		453.5	SS-2	13	7-7-10 (N = 17)	22.4					
10		448.5	SS-3	18	6-7-12 (N = 19)	17.9	34	20			HIGHER N-VALUE IN SS-1 MAY BE DUE TO THE PRESENCE OF GRAVEL IN SPLIT SPOON
	STIFF, Brown and gray-brown, silty and sandy, lean CLAY (CL), with trace black oxides, sightly moist to moist; ALLUVIUM										
15		443.5	SS-4	18	4-7-9 (N = 16)	24.7					
20		438.5	SS-5	18	4-4-7 (N = 11)	19.6					
	LOOSE, Brown and orange brown, clayey SAND (SC), with sand pockets, moist; ALLUVIUM		SS-6	13	4-5-5 (N = 10)						
25	LOOST to FIRM, Brown and tan, very fine to fine grained, poorly graded SAND (SP), moist to very moist; ALLUVIUM	433.5	UD-2	24		6.3				3	
30		428.5	SS-7	18	5-5-4 (N = 9)						
35		423.5	SS-8	16	4-4-4 (N = 8)	5.5					
40		418.5	SS-9	18	3-4-6 (N = 10)	4.7					
45		413.5	SS-10	15	7-7-7 (N = 14)	5.0					
50	BORING TERMINATED AT 50.0 FEET	408.5	SS-11	15	5-4-5 (N = 9)	4.5					BORING DRY UPON COMPLETION OF DRILLING
55		403.5									

START DATE: 1/19/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature]
Boring No.: **B-6C**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil, psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	TOPSOIL; FILL	450.3										SURFACE COVER: GRASS
	STIFF, Brown and red brown, mottled with gray, lean CLAY (CL), moist, FILL		SS-1		18	1-7-8 (N = 15)						
	STIFF, Brown and gray, silty, lean CLAY (CL), moist; FILL		SS-2		14	2-4-5 (N = 9)	24.9					
5		445.3										
	VERY STIFF, Brown, silty, lean CLAY (CL), moist; FILL		SS-3		18	5-10-7 (N = 17)	19.6					
10		440.3										
	FIRM, Brown and gray, clayey SAND (SC), wet; ALLUVIUM		SS-4		18	2-4-8 (N = 12)	21.9					
15	FIRM, Brown, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM	435.3										
	FIRM, Brown and light brown, fine to very fine grained, poorly graded SAND (SP), moist; ALLUVIUM		SS-5		18	1-5-6 (N = 11)	6.5					BORING CAVED IN AT A DEPTH OF 21.4 FEET UPON COMPLETION OF DRILLING
20	C	430.3										
	LOOSE, Brown and light brown, fine to coarse grained, poorly graded SAND (SP), moist; ALLUVIUM		SS-6		18	1-2-7 (N = 9)	5.1					
25	BORING TERMINATED AT 25.0 FEET	425.3										BORING DRY UPON COMPLETION OF DRILLING
30		420.3										
35		415.3										
40		410.3										
45		405.3										
50		400.3										
55		395.3										

START DATE: 1/23/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Tri-State Drilling, LLC
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature] **Boring No.: B-6T**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Note: *No information on the borings should be used without considering the entire content of the main document.*

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	DESCRIPTION	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT (1st 6" 2nd 6" 3rd 6") / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS
0	Poorly graded GRAVEL (GP) with fine to coarse SAND; FILL STIFF, Brown, orange-brown and bluish gray, silty, lean CLAY (CL), with trace black oxides, moist ; FILL	458.1	SS-1		10	5-6-6 (N = 12)	17.1					SURFACE COVER: GRAVEL & GRASS
			SS-2		10	4-3-7 (N = 10)						
5		453.1	UD-1		22		16.5	35	19			PZ INSTALLED IN OFFSET HOLE WITH SCREENED INTERVAL FROM 5.0-15.0 FEET; 1/29/2010 DRY 2/1/2010 DRY 2/12/2010 DRY
			SS-3		15	4-5-6 (N = 11)						
10	FIRM, Gray, silty, lean CLAY (CL), with trace organics, moist; FILL	448.1										
			SS-4		18	2-4-4 (N = 8)						
15		443.1	UD-2		24		22.1	39	22			
	VERY STIFF, Brown and gray, silty, lean CLAY (CL), moist; ALLUVIUM											
			SS-5		13	5-6-10 (N = 16)						
20		438.1										
	LOOSE to FIRM, Brown and tan, very fine to fine grained, poorly graded SAND (SP), moist; ALLUVIUM											
			SS-6		16	3-4-5 (N = 9)						
25		433.1	UD-3		21		6.4				3	PZ INSTALLED WITH SCREENED INTERVAL FROM 25.0-35.0 FEET; 1/29/2010 DRY 2/12/2010 DRY 2/12/2012 34.3 FT
			SS-7		14	3-4-5 (N = 9)						
30		428.1										
			SS-8		16	3-6-7 (N = 13)						
35		423.1	UD-4		21		4.6				3	
			SS-9		15	4-7-7 (N = 14)						
40		418.1										
			SS-10		18	4-5-7 (N = 12)	6.0					
45		413.1										
	LOOSE, Brown and tan, very fine to fine grained, poorly graded SAND (SP), with trace coarse sand and pebbles, very moist; ALLUVIUM											
			SS-11		14	4-4-4 (N = 8)	5.6					
50	BORING TERMINATED AT 50.0 FEET	408.1										BORING DRY UPON COMPLETION OF DRILLING
55		403.1										

START DATE: 1/20/2020
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: AB
Boring No.: B-7C

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS Note: *No information on the borings should be used without considering the entire content of the main document.*
0	TOPSOIL; FILL	448.1										SURFACE COVER: GRASS
	FIRM, Brown, mottled with gray, lean CLAY (CL), trace oxides, moist; FILL		SS-1		18	1-3-5 (N = 8)						
	STIFF, Brown and gray, silty, lean CLAY (CL), with oxides and trace fine gravel, organics, moist; FILL		SS-2		12	2-4-5 (N = 9)	23.6					
5		443.1										
	STIFF, Brown, mottled with gray, lean CLAY (CL), with oxides, moist; FILL		SS-3		18	2-5-9 (N = 14)	22.6					PZ INSTALLED WITH SCREENED INTERVAL FROM 10.0-20.0 FEET; 1/29/2010 DRY 2/1/2010 DRY 2/12/2010 25.8 FT
10		438.1										
	FIRM, Brown, lean CLAY (CL), moist to wet; FILL											
	LOOSE, Brown, fine grained, clayey SAND (SC), moist to wet; ALLUVIUM		SS-4		18	2-1-5 (N = 6)	20.4					
15	C	433.1										BORING CAVED IN AT A DEPTH OF 17.2 FEET UPON COMPLETION OF DRILLING
	LOOSE, Brown to light brown, fine to very fine grained, poorly graded SAND (SP), moist; ALLUVIUM		SS-5		18	3-4-6 (N = 10)	19.3					
20		428.1										
	FIRM, Light brown and tan, fine to coarse grained, poorly graded SAND (SP), with oxide, moist; ALLUVIUM		SS-6		18	3-5-7 (N = 12)	7.7					
25	BORING TERMINATED AT 25.0 FEET	423.1										BORING DRY UPON COMPLETION OF DRILLING
30		418.1										
35		413.1										
40		408.1										
45		403.1										
50		398.1										
55		393.1										

START DATE: 1/23/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By:
Boring No.: B-7T

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION — SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV MSL (ft)	SAMPLES: Sample Number	Sample Type	RECOV (in.)	N-COUNT (1st 6" 2nd 6" 3rd 6") / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS — Note: No information on the borings should be used without considering the entire content of the main document.
0	FIRM TO SOFT, Brown, silty, lean CLAY (CL) with sand, moist; FILL		472.9	SS-1		18	1-2-4 (N = 6)	13.6					SURFACE COVER: GRASS AND STRAW
				SS-2		14	2-2-1 (N = 3)	15.2					
5			467.9										
				SS-3		18	1-2-2 (N = 4)	15.9					
10			462.9										
	STIFF to FIRM, Dark brown and gray, silty, lean CLAY (CL), with sand and ASH (CCW), moist; FILL			SS-4		14	4-5-8 (N = 13)	32.2					
15			457.9										
				SS-5		16	2-1-4 (N = 5)	31.3					
20			452.9										
	STIFF, Light gray, silty, lean CLAY (CL), with ASH (CCW), moist; FILL			SS-6		18	3-8-6 (N = 14)	24.4					
25			447.9	UD-1		24							
				SS-7		18	1-5-7 (N = 12)	41.9					
30			442.9										
	SOFT, Dark gray, ASH (CCW), very moist; FILL			SS-8		2	1-2-1 (N = 3)	46.8					
35			437.9										
				SS-9		2	1-1-2 (N = 3)	43.0					
40		C	432.9										BORING CAVED IN AT A DEPTH OF 41.0 FEET UPON COMPLETION OF DRILLING
	FIRM, Dark gray, ASH (CCW), with strong sulfur odor, wet; FILL			SS-10		8	8-4-3 (N = 7)	96.2					
45			427.9										
	STIFF to VERY STIFF, Brown and gray, lean CLAY (CL), trace organics, moist; FILL (POSSIBLE CLAY LINER)			SS-11		18	4-5-6 (N = 11)	12.4					
50			422.9	UD-2		20		16.1	22	12			
	VERY FIRM to FIRM, Brown and tan, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM			SS-12		18	11-11-15						
55			417.9										

(CONTINUED ON FOLLOWING FIGURE)

START DATE: 1/27/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature] **Boring No.: B-7S**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS Note: *No information on the borings should be used without considering the entire content of the main document.*
55	VERY FIRM to FIRM, Brown and tan, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM		417.9				(N = 26)	18.6					
				SS-13		18	3-5-7 (N = 12)	6.0					
60			412.9										
	VERY FIRM, Brown and tan, fine to medium grained, poorly graded SAND (SP), with gravel and shell fragments, ALLUVIUM												
				SS-14		18	7-11-16 (N = 27)	4.7					
65	BORING TERMINATED AT 65.0 FEET		407.9										BORING DRY UPON COMPLETION OF DRILLING
70			402.9										
75			397.9										
80			392.9										
85			387.9										
90			382.9										
95			377.9										
100			372.9										
105			367.9										
110			362.9										

START DATE: 1/27/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: ABS
Boring No.: B-7S

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT (1st 6" / 2nd 6" / 3rd 6") RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	Poorly graded GRAVEL with fine to coarse SAND and organics, moist; FILL	458.0	SS-1	18	9-5-6 (N = 11)	15.5					SURFACE COVER: GRAVEL & GRASS
	STIFF to VERY STIFF, Brown, orange brown and blue-gray, silty and sandy, lean CLAY (CL), with trace organics and black oxides, moist; FILL										
5		453.0	SS-2	8	8-8-9 (N = 17)	11.6					
	STIFF, Blue-gray, brown and orange-brown, sandy, lean CLAY (CL), moist; ALLUVIUM		SS-3	15	3-4-6 (N = 10)						
10		448.0	UD-1	19		13.1	22	13			
15		443.0	SS-4	15	5-6-8 (N = 14)						
20		438.0	SS-5	18	3-5-8 (N = 13)						
			UD-2	24		20.6	40	21			
25		433.0	SS-6	18	4-4-6 (N = 10)						
	LOOSE, Reddish brown and gray, clayey SAND (SC), with SAND pockets, moist; ALLUVIUM										
30	LOOSE to FIRM, Brown and tan, very fine to fine grained, poorly graded SAND (SP), moist; ALLUVIUM	428.0	SS-7	18	3-3-5 (N = 8)	19.5					
35		423.0	SS-8	18	3-3-6 (N = 9)	8.3					
40		418.0	SS-9	18	3-5-8 (N = 13)	7.1				5	
45		413.0	SS-10	16	3-3-4 (N = 7)	10.8					BORING CAVED IN AT A DEPTH OF 48.0 FEET UPON COMPLETION OF DRILLING
	C										
50	LOOSE, Brown and tan, fine to coarse grained, poorly graded SAND (SP) with fine gravel, moist; ALLUVIUM	408.0	SS-11	15	3-5-5 (N = 10)	6.6					BORING DRY UPON COMPLETION OF DRILLING
	BORING TERMINATED AT 50.0 FEET										
55		403.0									

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

START DATE: 1/21/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: 9408 **Boring No.: B-8C**

MACTEC

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	TOPSOIL; FILL	447.1									SURFACE COVER: GRASS
	STIFF, Brown with gray, lean CLAY (CL), moist; FILL		SS-1	18	3-4-7 (N = 11)	26.2					
	FIRM, Brown, mottled with gray, silty, lean CLAY (CL), with trace organics, moist; FILL		SS-2	18	1-4-4 (N = 8)						
5		442.1	UD-1	24		26.5	38	21			
	FIRM, Brown, silty, lean CLAY (CL), with some oxides, moist; FILL		SS-3	18	3-4-3 (N = 7)	23.8					
10		437.1	UD-2	24							
	STIFF, Red brown and gray, sandy, lean CLAY (CL), wet; ALLUVIUM		SS-4	18	4-4-8 (N = 12)	25.1					
15	C	432.1									BORING CAVED IN AT A DEPTH OF 14.5 FEET UPON COMPLETION OF DRILLING
	FIRM, Light brown and gray, fine to medium grained, clayey SAND (SC), moist; ALLUVIUM		SS-5	18	5-7-8 (N = 15)	5.4					
20		427.1	UD-3	12		12.3				10	
	FIRM, Light brown and gray, fine to medium grained, poorly graded SAND (SP), with black strations, moist; ALLUVIUM		SS-6	18	4-7-5 (N = 12)	6.4					
25	BORING TERMINATED AT 25.0 FEET	422.1									BORING DRY UPON COMPLETION OF DRILLING
30		417.1									
35		412.1									
40		407.1									
45		402.1									
50		397.1									
55		392.1									

START DATE: 1/24/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [illegible] **Boring No.: B-8T**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS Note: No information on the borings should be used without considering the entire content of the main document.
0	FIRM to STIFF, Brown, silty, lean CLAY (CL), with debris (coal, rock, etc), moist; FILL	478.1	SS-1	18	3-3-4 (N = 7)	13.6					SURFACE COVER: GRASS AND STRAW
5		473.1	SS-2	18	3-5-7 (N = 12)	14.3					
10	STIFF, Brown and gray, lean CLAY (CL), moist; FILL	468.1	SS-3	8	3-7-6 (N = 13)	19.0					
	STIFF, Brown, sandy, lean CLAY (CL), moist; FILL										
15		463.1	SS-4	10	2-5-6 (N = 11)	15.4					
			UD-1	22		16.5	27	15			
20		458.1									
25	VERY STIFF, Gray, silty, lean CLAY (CL), with wood debris, moist; FILL	453.1	SS-5	6	8-10-11 (N = 21)	52.4					
	C										
30	FIRM, Light gray, sandy, silty, lean CLAY (CL) with ASH (CCW), moist; FILL	448.1	SS-6	8	5-4-4 (N = 8)	37.3					BORING CAVED IN AT A DEPTH OF 28.0 FEET UPON COMPLETION OF DRILLING
	SOFT, Gray, silty, lean CLAY (CL), with wood debris, moist; FILL										
35	SOFT to VERY SOFT, Gray, sandy, ASH (CCW), wet; FILL	443.1	SS-7	18	2-2-2 (N = 4)	52.6					
40		438.1	SS-8	18	1-2-2 (N = 4)	47.7					
45		433.1	SS-9	10	0-0-0 (N = 0)	53.0					SS-9, SS-10 AND SS-11 SAMPLES PENERATED UNDER WEIGHT OF HAMMER
50		428.1	SS-10	18	0-0-0 (N = 0)	51.3					
55		423.1	SS-11	18	0-0-0 (N = 0)	36.5					

(CONTINUED ON FOLLOWING FIGURE)

START DATE: 1/25/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [illegible] **Boring No.: B-8S**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS Note: *No information on the borings should be used without considering the entire content of the main document.*
55	SOFT to VERY SOFT, Gray, sandy, ASH (CCW), wet; FILL		423.1										
60	FIRM, Brown, light brown, fine to medium grained, poorly graded SAND (SP), trace fines, moist; ALLUVIUM		418.1	SS-12		18	5-7-9 (N = 16)	6.2					
	VERY FIRM, Brown, light brown, poorly graded SAND (SP), trace fines, moist; ALLUVIUM			SS-13		18	5-9-12 (N = 21)	4.6					
65	BORING TERMINATED AT 65.0 FEET		413.1										BORING DRY UPON COMPLETION OF DRILLING
70			408.1										
75			403.1										
80			398.1										
85			393.1										
90			388.1										
95			383.1										
100			378.1										
105			373.1										
110			368.1										

START DATE: 1/25/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By:
Boring No.: **B-8S**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD / % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: *No information on the borings should be used without considering the entire content of the main document.*)
0	Densely Graded Aggregate (DGA), very moist; FILL		457.8	SS-1		15	17-30-41 (N = 71)	12.2					SURFACE COVER: DGA
	DENSE, Brown and gray, fine to coarse grained, clayey SAND (SC), and ASH (CCW), with trace gravel, moist; FILL			SS-2		16	7-14-17 (N = 31)	8.1					HIGHER N-VALUES IN SS-1 AND SS-2 MAY BE DUE TO THE PRESENCE OF GRAVEL IN SPLIT SPOONS
5			452.8										
	STIFF, Gray, silty, lean CLAY (CL), moist; ALLUVIUM			SS-3		18	4-5-9 (N = 14)	20.7					
10			447.8										
				SS-4		18	5-5-8 (N = 13)	24.0					
15			442.8	UD-1		24							
	LOOSE, Orange brown and gray, fine grained, clayey SAND (SC), very moist; ALLUVIUM			SS-5		18	3-3-4 (N = 7)	19.3					
20			437.8										
				SS-6		12	4-4-6 (N = 10)	25.4					
25	FIRM to LOOSE, Tan, very fine to fine grained, poorly graded SAND (SP), moist; ALLUVIUM		432.8										
				SS-7		18	4-4-6 (N = 10)	3.7					
30			427.8										
				SS-8		18	4-4-7 (N = 11)	4.1					
35			422.8	UD-2		16							
				SS-9		18	3-5-4 (N = 9)	4.7					
40			417.8										
	FIRM, Tan, fine to coarse grained, poorly graded SAND (SP), with pebbles, moist; ALLUVIUM	C		SS-10		18	2-6-9 (N = 15)	4.1					BORING CAVED IN AT A DEPTH OF 43.5 FEET UPON COMPLETION OF DRILLING
45			412.8										
				SS-11		16	5-6-8 (N = 14)	4.9					
50	BORING TERMINATED AT 50.0 FEET		407.8										BORING DRY UPON COMPLETION OF DRILLING
55			402.8										

START DATE: 1/24/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: 9403 **Boring No.: B-9C**

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MACTEC SOIL-ROCK (SITE MAP) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

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Project:	Cane Run Station - ATB/E-Pond Crest Borings		
Project No.:	3143-10-1216		
Prepared By:	ALB	Date:	01/26/10
Checked By:	NRJ	Date:	02/16/10

Statistical Analysis of Standard Penetration Test (SPT) Resistances (N-values)

Depth* (feet)	B-1C	B-2C	B-3C	B-3.5C	B-4C	B-5C	B-6C	B-7C	B-8C	B-9C	Statistical Analysis: Min.	Max.	Std. Dev.	Var.	Avg.
1.5	11	12	8	24	10	13		12	11		8	24	4	23	12
3.5	-	-	-	-	-	-	UD	-	-	-	-	-	-	-	-
5.0	12	11	13	13	12	12	17	10	17	31	10	31	6	37	14
7.0	-	UD	-	-	-	-	-	UD	-	-	-	-	-	-	-
10.0	11	15	9	8	11	13	19	11	10	14	8	19	3	10	12
12.0	UD	-	-	-	UD	-	-	-	UD	-	-	-	-	-	-
15.0	7	9	8	14	6	10	16	8	14	13	6	16	3	12	10
17.0	-	UD	UD	-	-	UD	-	UD	-	UD	-	-	-	-	-
20.0	13	12	8	10	12	8	11	16	13	7	7	16	2	7	11
22.0	-	-	-	UD	-	-	-	-	UD	-	-	-	-	-	-
25.0	10	7	9	10	17	9	10	9	10	10	7	17	2	6	10
27.0	UD	-	-	-	UD	-	UD	UD	-	-	-	-	-	-	-
30.0	7	8	12	11	10	11	9	9	8	10	7	12	1	2	9
32.0	-	UD	UD	-	-	UD	-	-	-	-	-	-	-	-	-
35.0	10	9	10	5	5	7	8	13	9	11	5	13	2	6	8
37.0	-	-	-	-	-	-	-	UD	-	UD	-	-	-	-	-
40.0	8	9	10	10	10	9	10	14	13	9	8	14	1	3	10
42.0	UD	-	-	-	UD	-	-	-	-	-	-	-	-	-	-
45.0	9	11	12	14	4	11	14	12	7	15	4	15	3	11	10
47.0	-	-	UD	-	-	UD	-	-	-	-	-	-	-	-	-
50.0	10	14	16	11	6	18	9	8	10	14	6	18	3	14	11
											4	31	3	13	11

Note(s): *Indicates bottom depth of sample.

CL (Fill)
CL (Alluvium)
SC (Alluvium)
SP (Alluvium)
Ash (CCW)

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Project:	Cane Run Station - ATB/E-Pond Toe Borings
Project No.:	3143-10-1216
Prepared By:	ALB — Date: 01/28/10
Checked By:	NRJ — Date: 02/16/10

Statistical Analysis of Standard Penetration Test (SPT) Resistances (N-values)

Depth* (feet)	B-1T	B-2T	B-3T	B-3.5T	B-4T	B-5T	B-6T	B-7T	B-8T	Statistical Analysis: Min.	Max.	Std. Dev.	Var.	Avg.
1.5	-	-	-	5	7	7	-	-	-	5	7	1	1	6
2.5	9	10	9	-	-	-	15	8	11	8	15	2	6	10
5.0	9	14	6	13	13	11	9	9	8	6	14	2	7	10
7.0	UD	-	UD	UD	-	-	-	-	UD	-	-	-	-	-
10.0	19	16	8	9	12	10	17	14	7	7	19	4	18	12
12.0	UD	-	UD	-	-	-	-	-	UD	-	-	-	-	-
15.0	11	16	10	14	15	12	12	6	12	6	16	2	8	12
17.0	UD	-	UD	-	-	-	-	-	-	-	-	-	-	-
20.0	6	16	11	10	14	11	11	10	15	6	16	3	9	11
22.0						-	-	-	UD	-	-	-	-	-
25.0						6	9	12	12	6	12	2	8	9
										6	19	3	9	11

Note(s): *Indicates bottom depth of sample.

- CL (Fill)
- CL (Alluvium)
- SC (Alluvium)
- SP (Alluvium)
- Ash (CCW)

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Project:	Cane Run Station - ATB/E-Pond Stockpile Borings		
Project No.:	3143-10-1216		
Prepared By:	ALB	Date:	01/28/10
Checked By:	NRJ	Date:	02/16/10

Statistical Analysis of Standard Penetration Test (SPT) Resistances (N-values)

Depth* (feet)	B-7S	B-8S	Statistical Analysis Min.	Max.	Std. Dev.	Var.	Avg.
1.5	6	7	6	7	0	0	6
5.0	3	12	3	12	6	40	7
10.0	4	13	4	13	6	40	8
15.0	13	11	11	13	1	2	12
17.0	-	UD	-	-	-	-	-
20.0	5	-	5	5	-	-	5
25.0	14	21	14	21	4	24	17
27.0	UD	-	-	-	-	-	-
30.0	12	8	8	12	2	8	10
35.0	3	4	3	4	0	0	3
40.0	3	4	3	4	0	0	3
45.0	7	0	0	7	4	24	3
50.0	11	0	0	11	7	60	5
52.0	UD	-	-	-	-	-	-
54.0	UD	-	-	-	-	-	-
55.0	-	0	-	-	-	-	-
60.0	12	16	12	16	2	8	14
65.0	27	21	21	27	4	18	24
			0	27	6	48	9

CL (Fill)

SP (Alluvium)

Ash (CCW)

Note(s): *Indicates bottom depth of sample.

SUMMARY OF LABORATORY RESULTS

Borehole	Depth	Sample Type	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf): Dry Density	Unit Weight (pcf): Wet Density	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core: RQD	Rock Core: Percent Recovery	% Finer #200
B-1C	0.0	SS					17.8										
B-1C	3.5	SS					22.0										
B-1C	8.5	SS					20.8										
B-1C	10.0	UD	33	20	13	CL	16.3			111.4	129.5			2.66			
B-1C	13.5	SS					21.7										
B-1C	18.5	SS					18.8										
B-1C	23.5	SS					7.4										
B-1C	28.5	SS					8.6										
B-1C	33.5	SS					6.2										
B-1C	38.5	SS					5.8										
B-1C	43.5	SS					6.7										
B-1C	48.5	SS					8.8										
B-1T	3.5	SS					27.9										
B-1T	8.5	SS					21.3										
B-1T	10.0	UD	41	19	22	CL	22.0			102.4	124.9			2.73			87
B-1T	13.5	SS					6.4										
B-1T	18.5	SS					8.4										
B-2C	0.0	SS					19.0										
B-2C	5.0	UD	41	22	19	CL	14.5			115.5	132.2						
B-2C	15.0	UD	39	21	18	CL	19.9			105.4	126.4						
B-2C	23.5	SS					12.0										
B-2C	30.0	UD				SP	5.6			97.0	102.5						2
B-2C	38.5	SS					5.0										
B-2C	43.5	SS					4.9										
B-2C	48.5	SS				SP	3.9										4
B-2T	3.5	SS					18.6										

Remarks:

* SPT/SS = Split-spoon
UD/SH = Undisturbed sample
BG = Bulk / bag sample
RC = Rock core

Summary of Laboratory Results

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [illegible]

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MACTEC_LAB-SUMMARY LANDSCAPE (SP GRAV) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Borehole	Depth	Sample Type	Atterberg Limits			USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf)		Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core		% Finer #200
			Liquid Limit	Plastic Limit	Plasticity Index					Dry Density	Wet Density				RQD	Percent Recovery	
B-2T	8.5	SS					21.9										
B-2T	13.5	SS					15.0										
B-2T	18.5	SS					6.2										
B-3C	0.0	SS					15.8										
B-3C	3.5	SS					16.1										
B-3C	8.5	SS					23.2										
B-3C	15.0	UD	37	20	17	CL	19.9			103.9	124.6			2.72			83
B-3C	23.5	SS					7.7										
B-3C	28.5	SS					5.9										
B-3C	33.5	SS					5.5										
B-3C	38.5	SS					5.8										
B-3C	43.5	SS					5.9										
B-3C	48.5	SS					4.8										
B-3T	3.5	SS					32.3										
B-3T	5.0	UD	32	17	15	CL	21.0			102.6	124.2			2.74			
B-3T	8.5	SS					22.3										
B-3T	10.0	UD				SC	19.9			101.8	122.1			2.70			20
B-3T	13.5	SS					7.6										
B-3T	18.5	SS					6.1										
B-4C	0.0	SS					18.9										
B-4C	3.5	SS					16.5										
B-4C	8.5	SS					21.5										
B-4C	10.0	UD	40	18	22	CL	19.3			106.1	126.6			2.69			
B-4C	13.5	SS					22.0										
B-4C	18.5	SS					12.6										
B-4C	23.5	SS					5.8										

Remarks:

* SPT/SS = Split-spoon
UD/SH = Undisturbed sample
BG = Bulk / bag sample
RC = Rock core

Summary of Laboratory Results

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: AB

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MACTEC_LAB-SUMMARY LANDSCAPE (SP GRAV) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Borehole	Depth	Sample Type	Atterberg Limits			USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf)		Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core		% Finer #200
			Liquid Limit	Plastic Limit	Plasticity Index					Dry Density	Wet Density				RQD	Percent Recovery	
B-4C	25.0	UD				SP	7.8			78.9	85.0			2.65			2
B-4C	28.5	SS					5.5										
B-4C	33.5	SS					6.6										
B-4C	38.5	SS					4.3										
B-4C	43.5	SS					6.6										
B-4C	48.5	SS					6.0										
B-4T	0.0	SS					17.3										
B-4T	3.5	SS					22.1										
B-4T	8.5	SS					19.6										
B-4T	13.5	SS					11.8										
B-4T	18.5	SS					5.4										
B-5C	0.0	SS					16.1										
B-5C	3.5	SS					17.0										
B-5C	8.5	SS					18.3										
B-5C	13.5	SS	40	22	18	CL	20.9										
B-5C	15.0	UD	41	21	20	CL	22.9			97.9	120.3			2.69			
B-5C	23.5	SS					13.3										
B-5C	28.5	SS					5.2										
B-5C	33.5	SS					6.1										
B-5C	38.5	SS					7.3										
B-5C	43.5	SS					3.4										
B-5C	45.0	UD				SP	5.4			98.3	103.6			2.64			5
B-5C	48.5	SS					4.1										
B-5T	0.0	SS					29.9										
B-5T	3.5	SS					24.9										
B-5T	8.5	SS				SC	19.6										29

Remarks:

* SPT/SS = Split-spoon
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RC = Rock core

Summary of Laboratory Results

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature]

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MACTEC_LAB-SUMMARY LANDSCAPE (SP GRAV) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Borehole	Depth	Sample Type	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf): Dry Density	Unit Weight (pcf): Wet Density	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core: RQD	Rock Core: Percent Recovery	% Finer #200
B-5T	13.5	SS					9.0										
B-5T	18.5	SS					4.6										
B-5T	23.5	SS					3.9										
B-6C	1.5	UD	36	19	17	CL	15.9			115.2	133.6			2.71			
B-6C	3.5	SS					22.4										
B-6C	8.5	SS	34	20	14	CL	17.9										
B-6C	13.5	SS					24.7										
B-6C	18.5	SS					19.6										
B-6C	25.0	UD				SP	6.3			85.8	91.2						3
B-6C	33.5	SS					5.5										
B-6C	38.5	SS					4.7										
B-6C	43.5	SS					5.0										
B-6C	48.5	SS					4.5										
B-6T	3.5	SS					24.9										
B-6T	8.5	SS					19.6										
B-6T	13.5	SS					21.9										
B-6T	18.5	SS					6.5										
B-6T	23.5	SS					5.1										
B-7C	0.0	SS					17.1										
B-7C	5.0	UD	35	19	16	CL	16.5			113.6	132.3						
B-7C	15.0	UD	39	22	17	CL	22.1			102.1	124.7						
B-7C	25.0	UD				SP	6.4			92.5	98.4						3
B-7C	35.0	UD				SP	4.6			113.5	118.8						3
B-7C	43.5	SS					6.0										
B-7C	48.5	SS					5.6										
B-7S	0.0	SS					13.6										

Remarks:

* SPT/SS = Split-spoon
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RC = Rock core

Summary of Laboratory Results

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By:

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MACTEC_LAB-SUMMARY LANDSCAPE (SP GRAV) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Borehole	Depth	Sample Type	Atterberg Limits			USCS Classification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf)		Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core		% Finer #200
			Liquid Limit	Plastic Limit	Plasticity Index					Dry Density	Wet Density				RQD	Percent Recovery	
B-7S	3.5	SS					15.2										
B-7S	8.5	SS					15.9										
B-7S	13.5	SS					32.2										
B-7S	18.5	SS					31.3										
B-7S	23.5	SS					24.4										
B-7S	28.5	SS					41.9										
B-7S	33.5	SS					46.8										
B-7S	38.5	SS					43.0										
B-7S	43.5	SS					96.2										
B-7S	48.5	SS					12.4										
B-7S	50.0	UD	22	12	10	CL	16.1			117.2	136.0			2.66			
B-7S	53.5	SS					18.6										
B-7S	58.5	SS					6.0										
B-7S	63.5	SS					4.7										
B-7T	3.5	SS					23.6										
B-7T	8.5	SS					22.6										
B-7T	13.5	SS					20.4										
B-7T	18.5	SS					19.3										
B-7T	23.5	SS					7.7										
B-8C	0.0	SS					15.5										
B-8C	3.5	SS					11.6										
B-8C	10.0	UD	22	13	9	CL	13.1			123.8	140.1						
B-8C	20.0	UD	40	21	19	CL	20.6			104.9	126.5			2.75			
B-8C	28.5	SS					19.5										
B-8C	33.5	SS					8.3										
B-8C	38.5	SS				SP	7.1										5

Remarks:

* SPT/SS = Split-spoon
UD/SH = Undisturbed sample
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Summary of Laboratory Results

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By:

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Borehole	Depth	Sample Type	Atterberg Limits			USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf)		Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core		% Finer #200
			Liquid Limit	Plastic Limit	Plasticity Index					Dry Density	Wet Density				RQD	Percent Recovery	
B-8C	43.5	SS					10.8										
B-8C	48.5	SS					6.6										
B-8S	0.0	SS					13.6										
B-8S	3.5	SS					14.3										
B-8S	8.5	SS					19.0										
B-8S	13.5	SS					15.4										
B-8S	15.0	UD	27	15	12	CL	16.5			117.0	136.4			2.70			
B-8S	23.5	SS					52.4										
B-8S	28.5	SS					37.3										
B-8S	33.5	SS					52.6										
B-8S	38.5	SS					47.7										
B-8S	43.5	SS					53.0										
B-8S	48.5	SS					51.3										
B-8S	53.5	SS					36.5										
B-8S	58.5	SS					6.2										
B-8S	63.5	SS					4.6										
B-8T	1.0	SS					26.2										
B-8T	5.0	UD	38	21	17	CL	26.5			98.9	125.1			2.67			
B-8T	8.5	SS					23.8										
B-8T	13.5	SS					25.1										
B-8T	18.5	SS					5.4										
B-8T	20.0	UD				SC	12.3			120.1	134.9			2.68			10
B-8T	23.5	SS					6.4										
B-9C	0.0	SS					12.2										
B-9C	3.5	SS					8.1										
B-9C	8.5	SS					20.7										

Remarks:

* SPT/SS = Split-spoon
UD/SH = Undisturbed sample
BG = Bulk / bag sample
RC = Rock core

Summary of Laboratory Results

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: ADS

MACTEC

MACTEC_LAB-SUMMARY LANDSCAPE (SP GRAV) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Borehole	Depth	Sample Type	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf): Dry Density	Unit Weight (pcf): Wet Density	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core: RQD	Rock Core: Percent Recovery	% Finer #200
B-9C	13.5	SS					24.0										
B-9C	18.5	SS					19.3										
B-9C	23.5	SS					25.4										
B-9C	28.5	SS					3.7										
B-9C	33.5	SS					4.1										
B-9C	38.5	SS					4.7										
B-9C	43.5	SS					4.1										
B-9C	48.5	SS					4.9										

Remarks:

* SPT/SS = Split-spoon
UD/SH = Undisturbed sample
BG = Bulk / bag sample
RC = Rock core

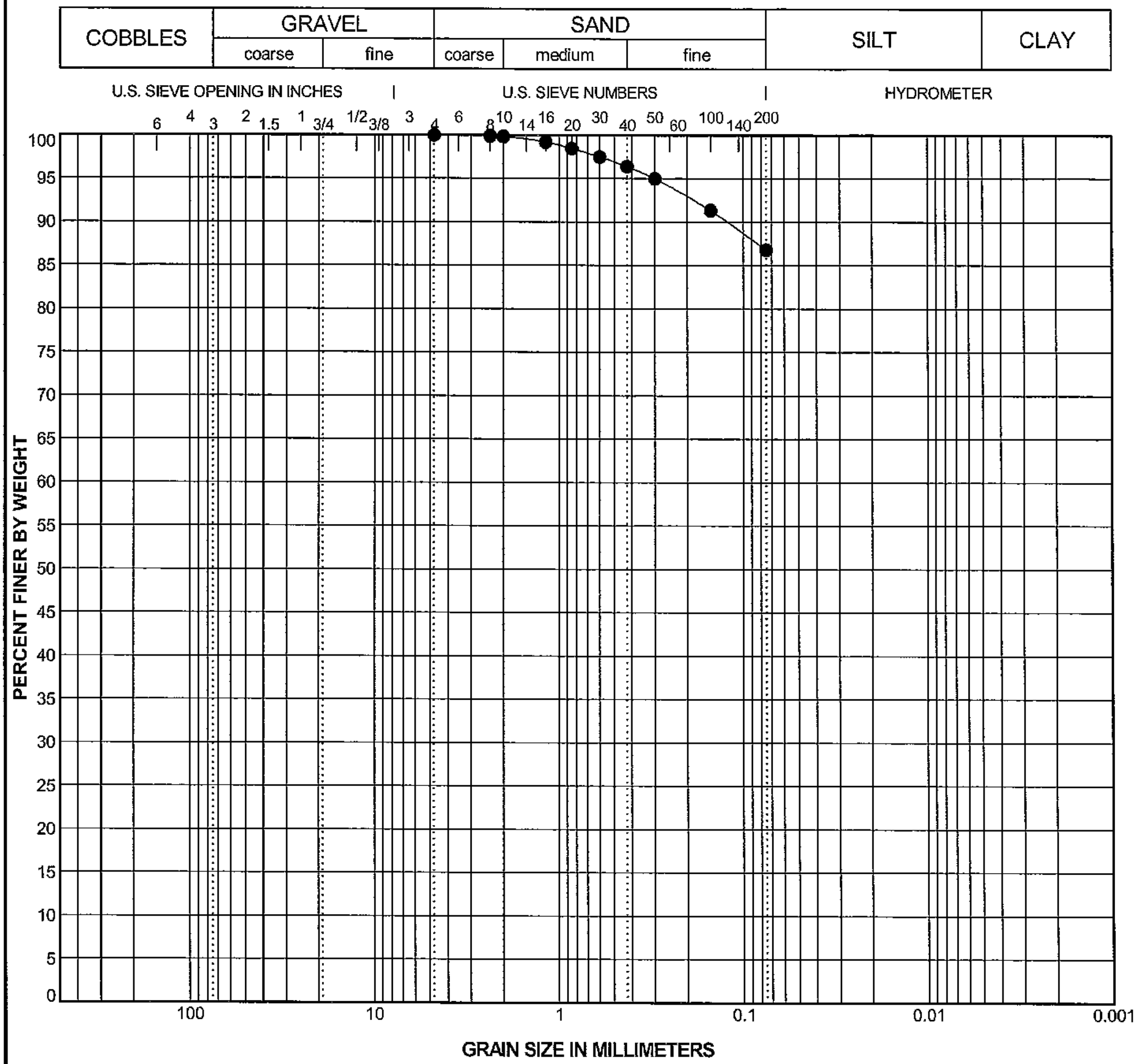
Summary of Laboratory Results

Project: ATB / E-Pond Complex
Project No: 3143-10-1216
Checked By: [signature]

MACTEC

MACTEC_LAB-SUMMARY LANDSCAPE (SP GRAV) 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

GRAIN SIZE DISTRIBUTION TEST RESULTS



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-1T	10.0-12.0	Brown, lean CLAY	CL	4.75					

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

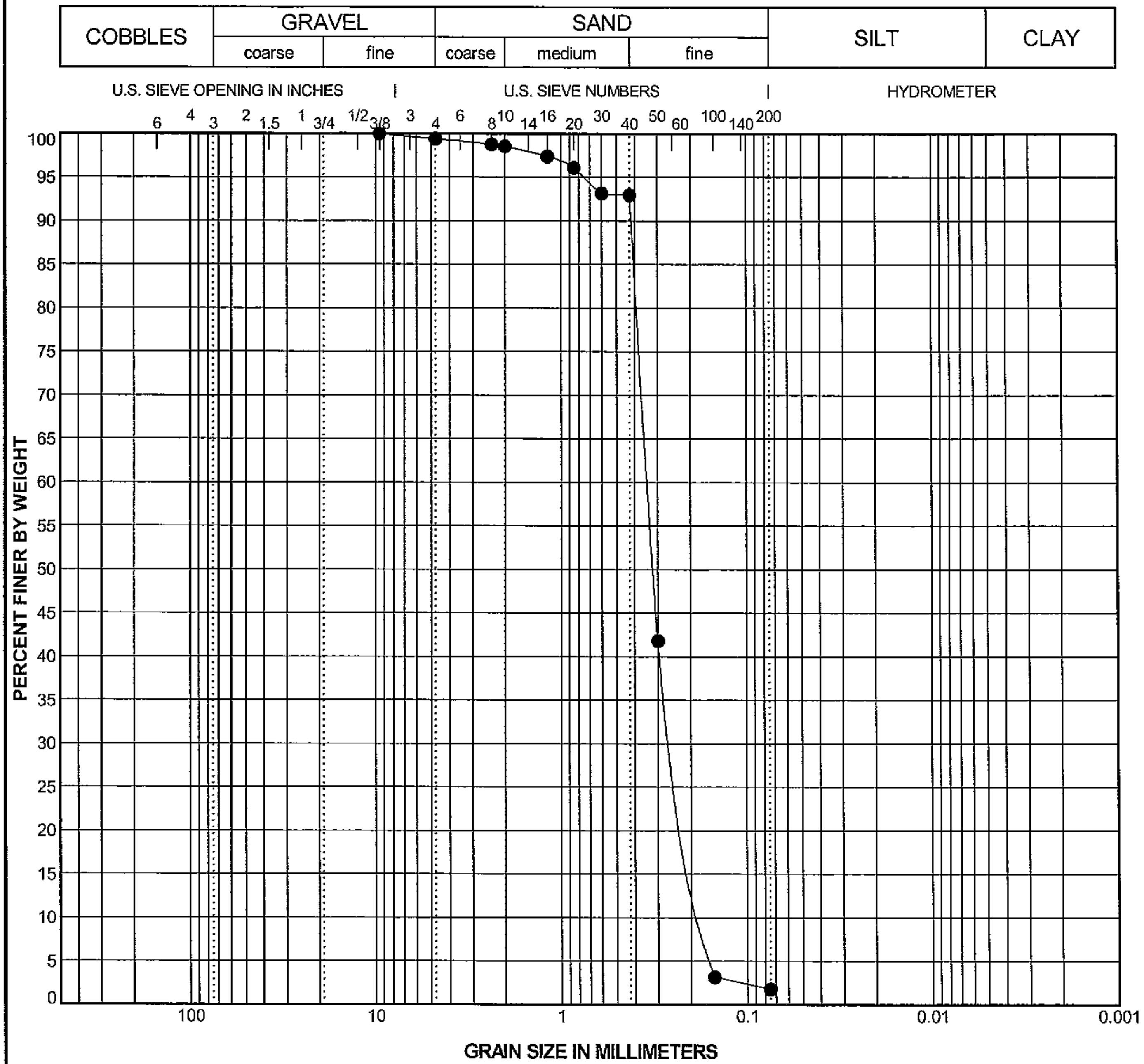
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: AD

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-2C	30.0-32.0	Brown, poorly graded SAND	SP	9.5	0.339	0.243	0.17	1.02	2.00

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

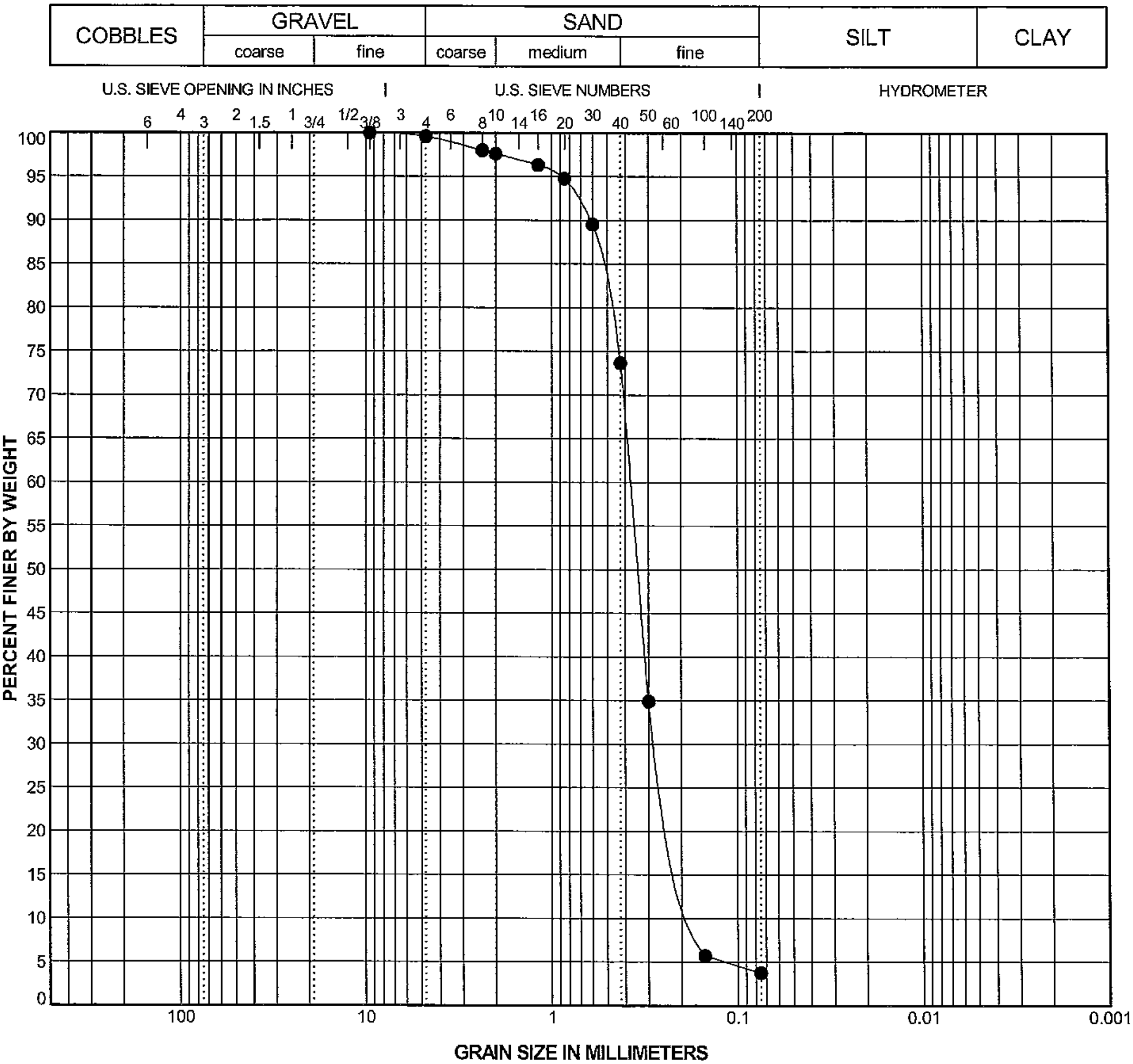
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-2C	48.5-50	Brown, poorly graded SAND	SP	9.5	0.376	0.267	0.166	1.14	2.26

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

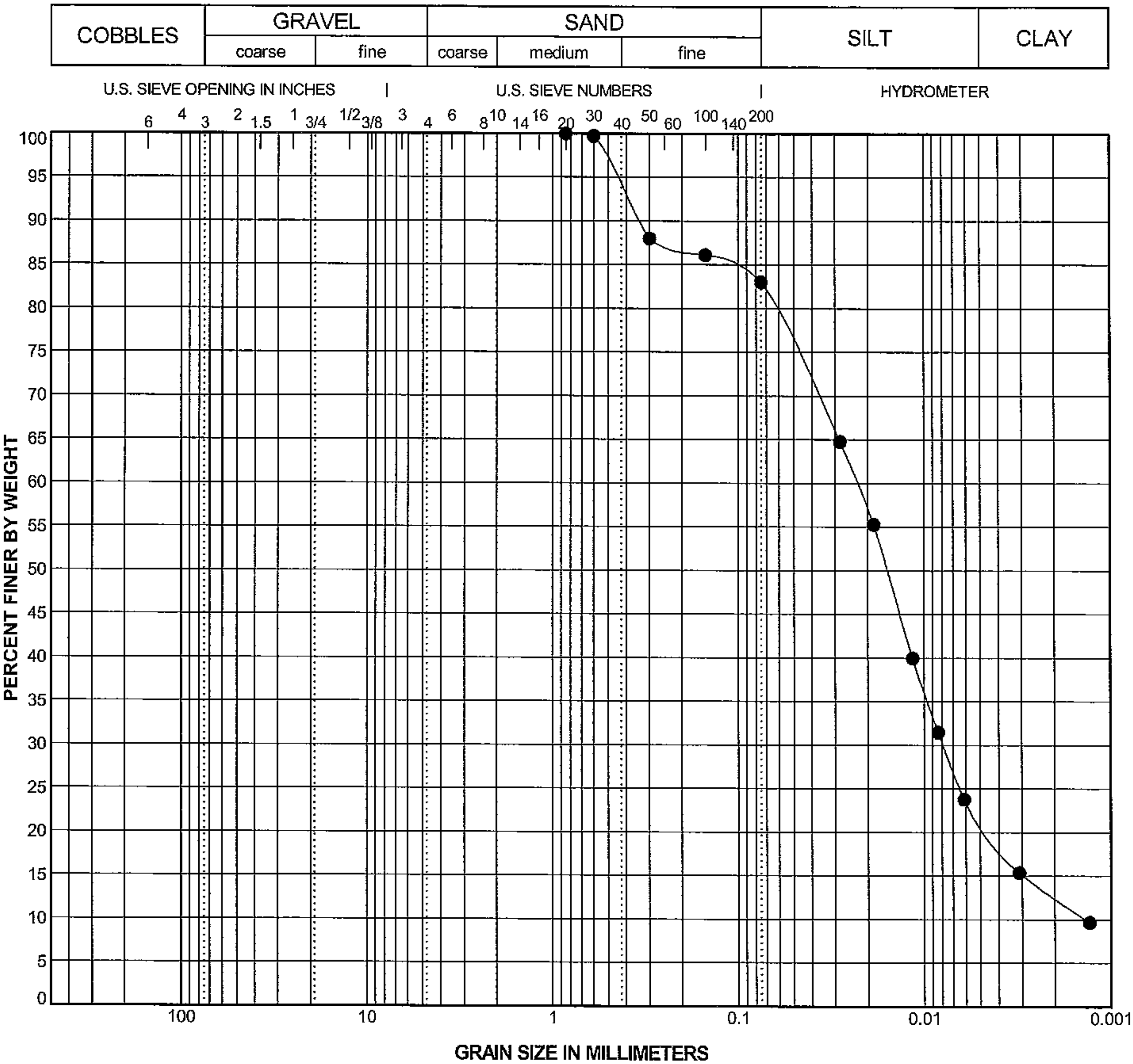
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-3C	15.0-17.0	Gray-brown, lean CLAY	CL	0.85	0.023	0.008	0.001	2.00	16.79

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

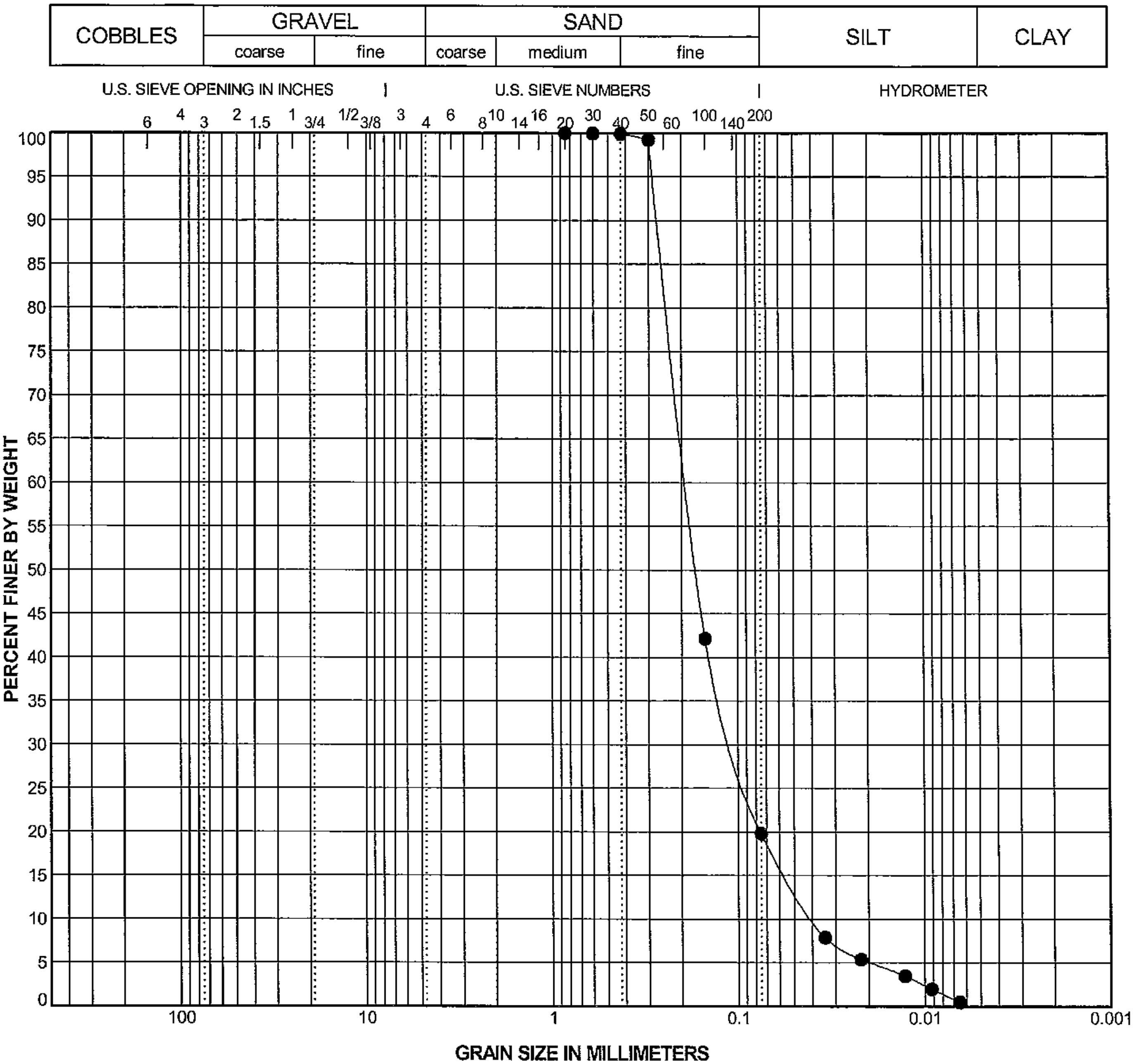
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: ASB

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-3T	10.0-12.0	Brown, clayey SAND	SC	0.85	0.186	0.103	0.039	1.45	4.74

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10

Remarks:

Test Method - ASTM D422

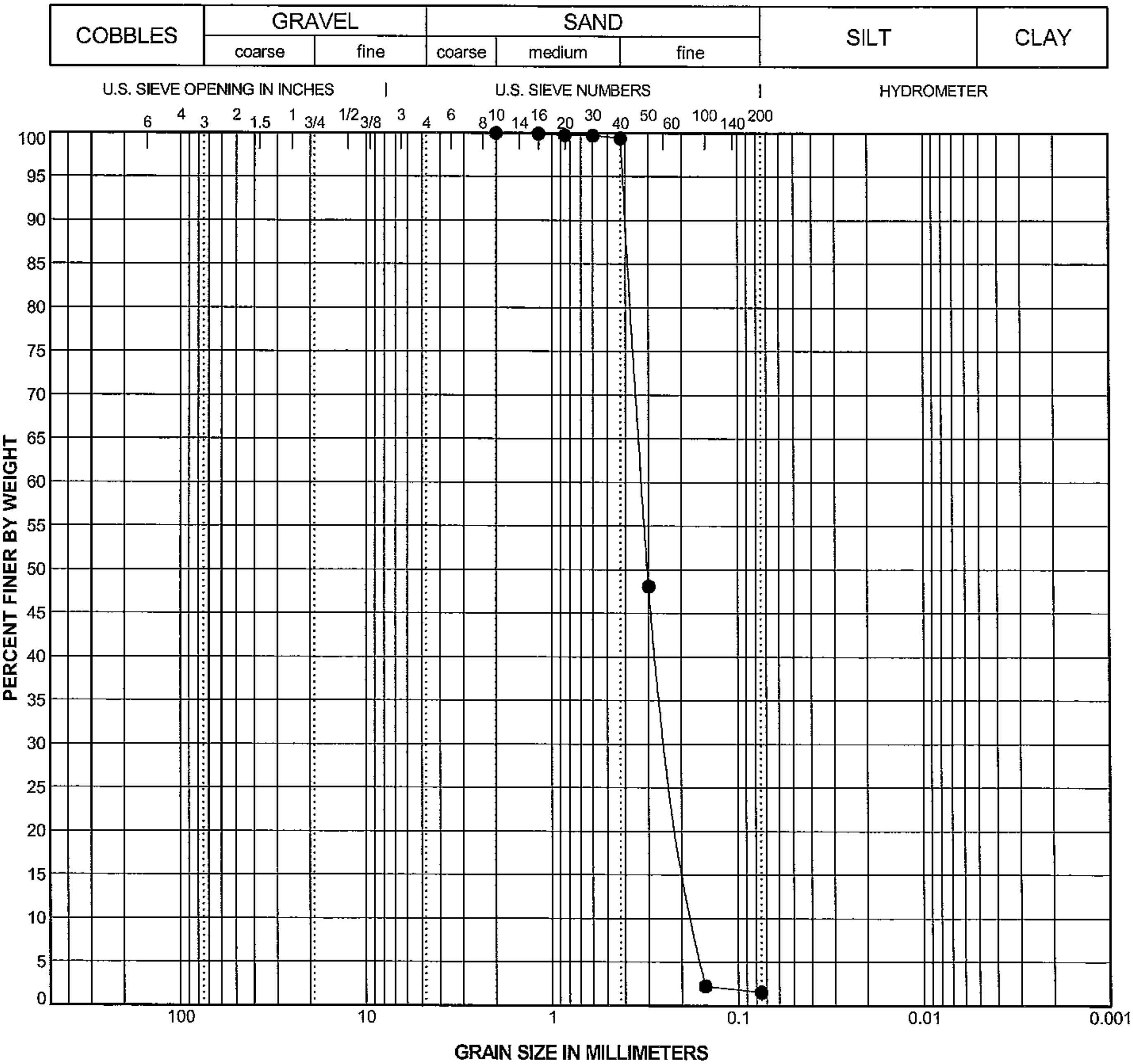
GRAIN SIZE DISTRIBUTION

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-4C	25.0-27.0	Brown, poorly graded SAND	SP	2	0.325	0.228	0.169	0.95	1.93

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

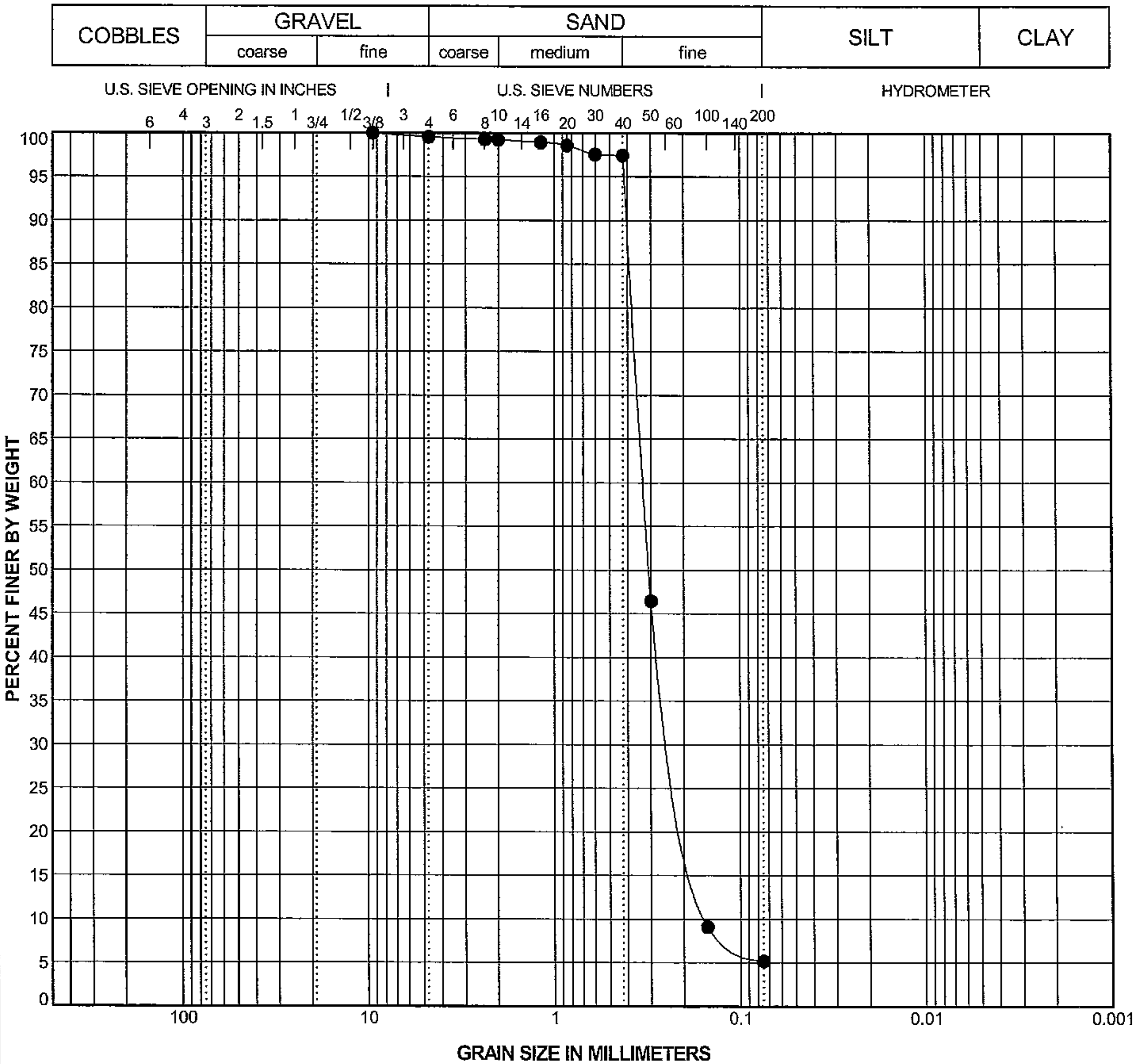
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-5C	45.0-47.0	Orange-brown, poorly graded SAND	SP	9.5	0.329	0.221	0.152	0.97	2.16

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10

Remarks:

Test Method - ASTM D422

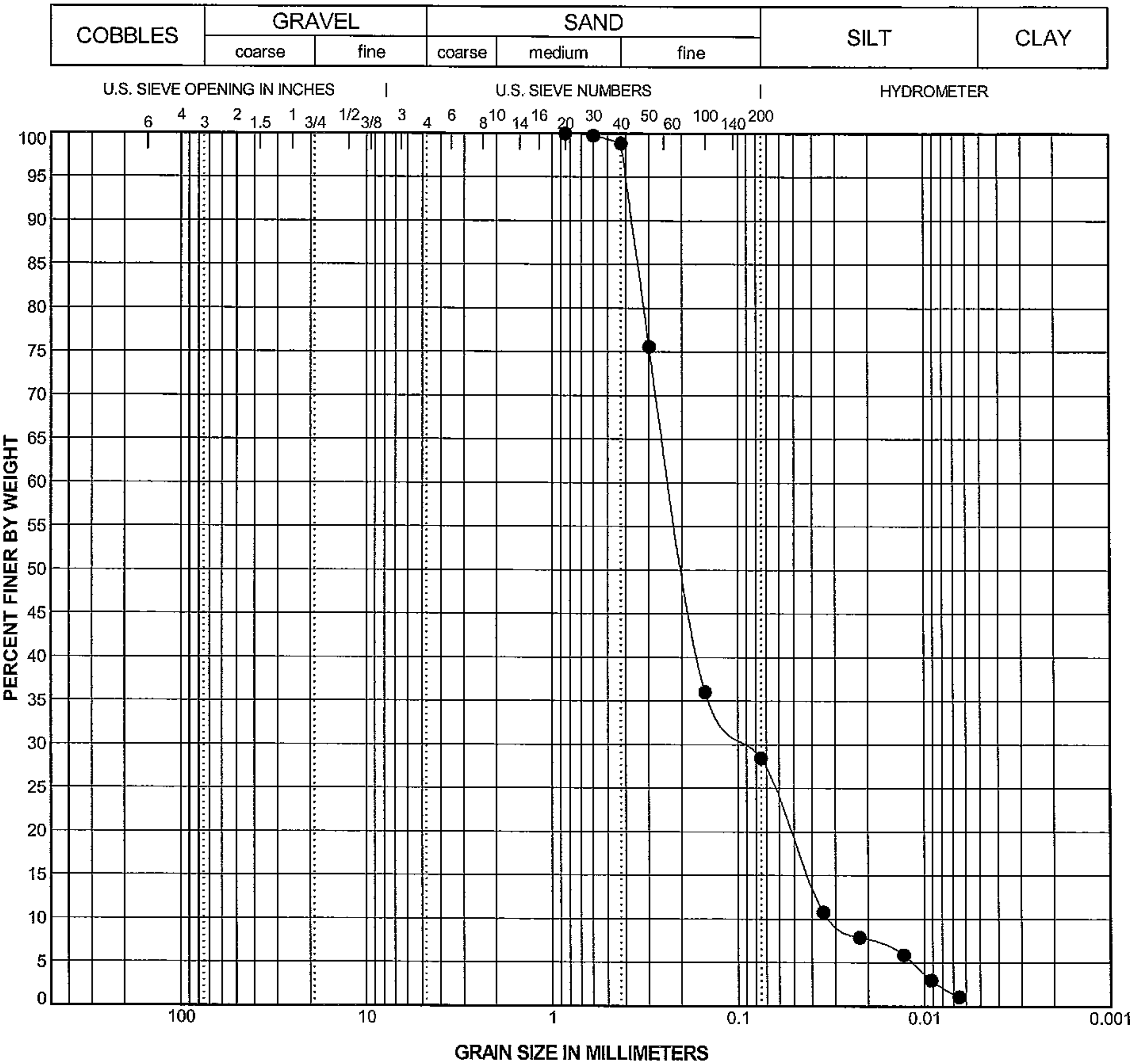
GRAIN SIZE DISTRIBUTION

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-5T	8.5-10.0	Dark brown, clayey SAND	SC	0.85	0.228	0.086	0.031	1.06	7.42

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

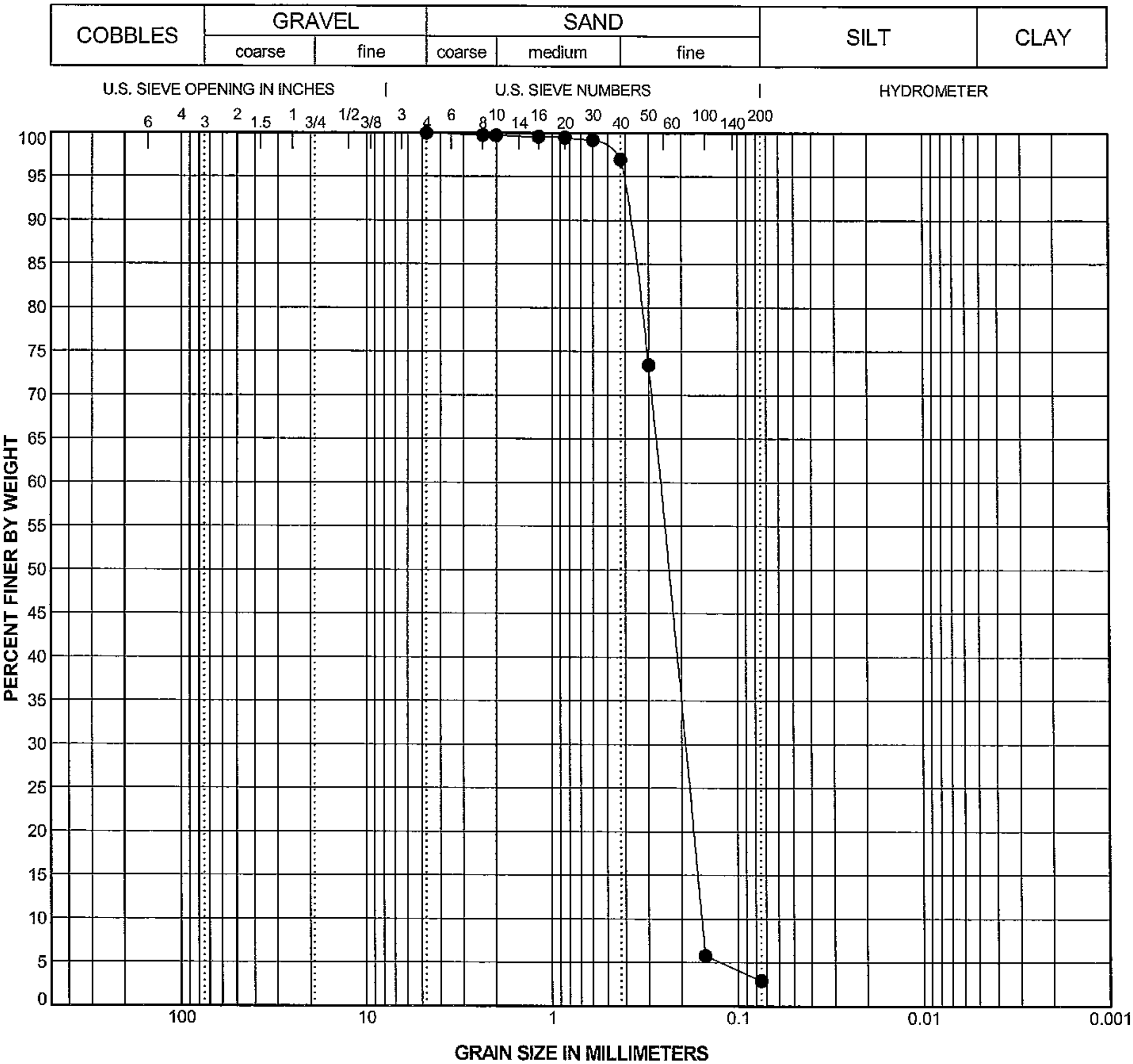
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: SHS

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-6C	25.0-27.0	Brown, poorly graded SAND	SP	4.75	0.261	0.192	0.157	0.90	1.67

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

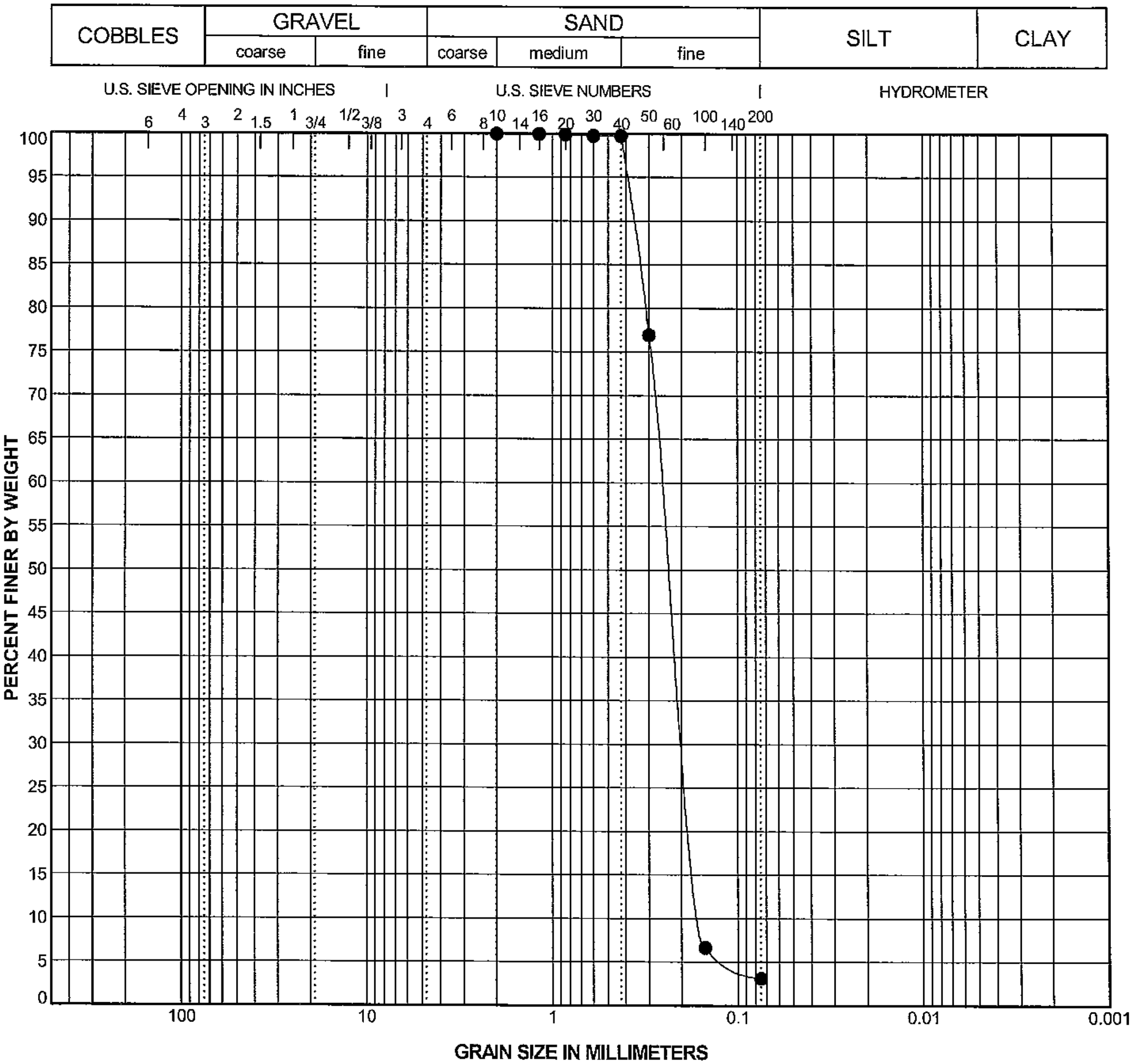
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By:

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-7C	25.0-27.0	Brown, poorly graded SAND	SP	2	0.254	0.189	0.155	0.91	1.64

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

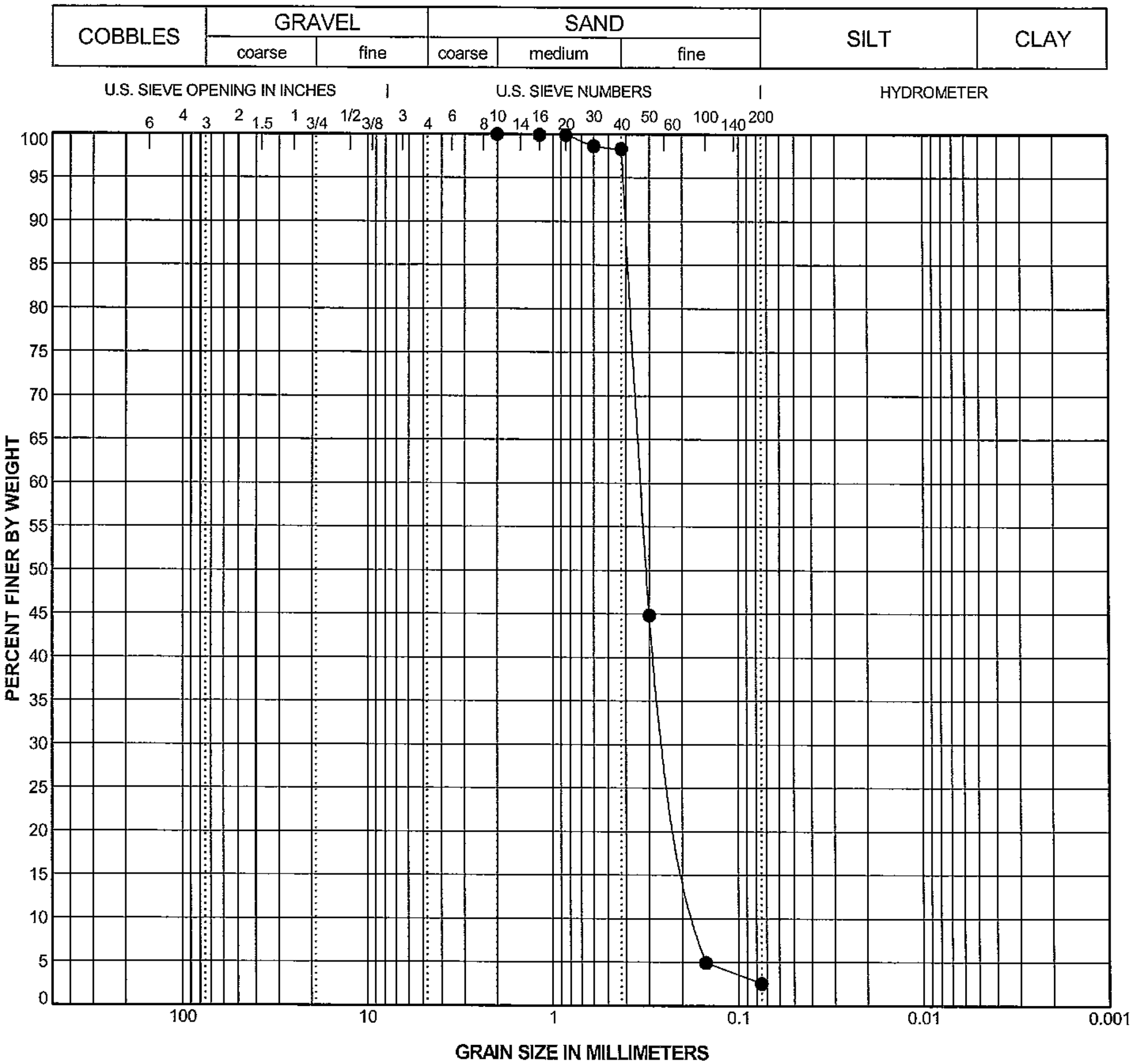
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By:

MACTEC

MACTEC_GRAIN_SIZE 31431012l6 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-7C	35.0-37.0	Brown, poorly graded SAND	SP	2	0.331	0.232	0.164	0.99	2.02

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

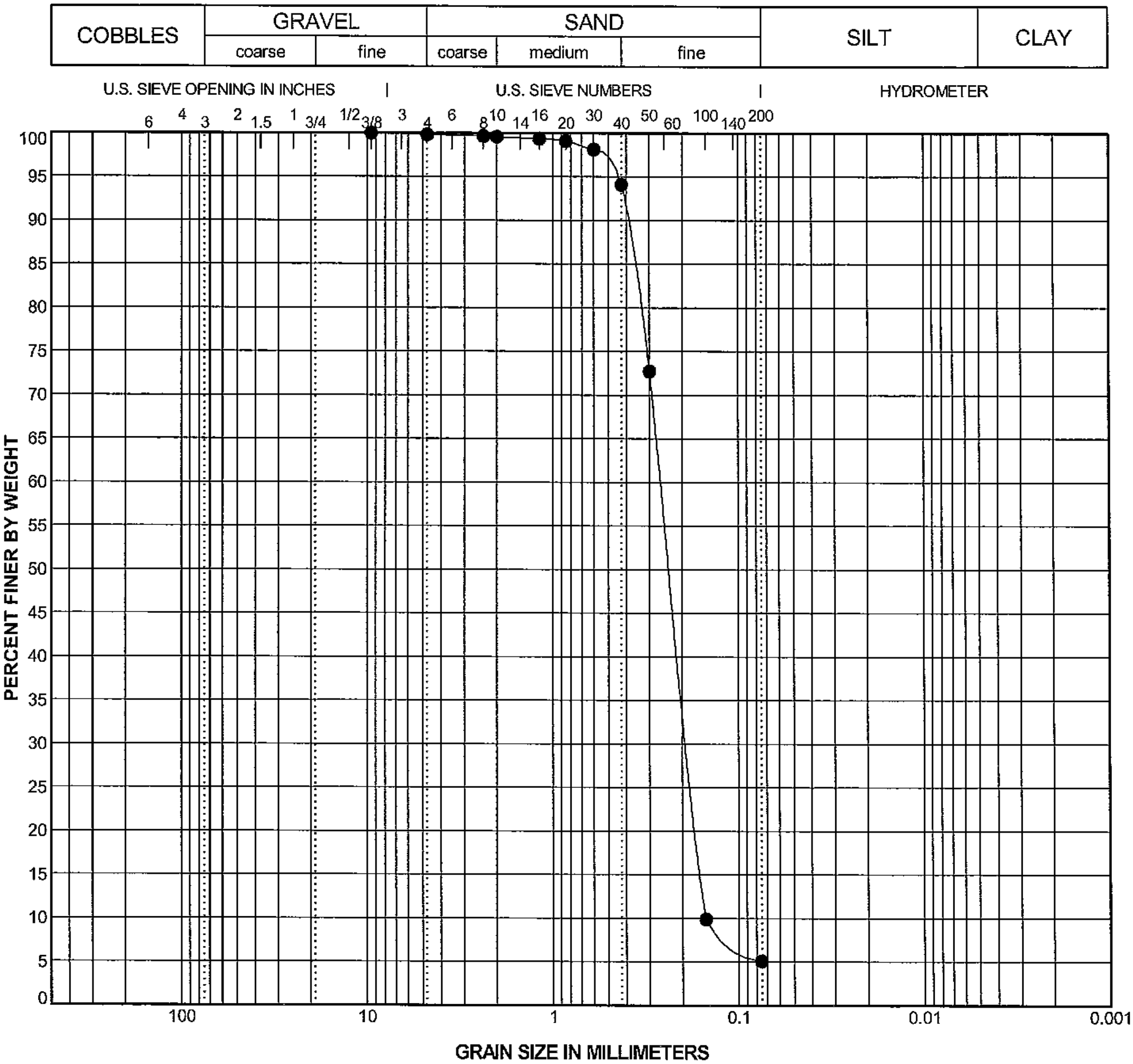
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-8C	38.5-40.0	Brown, poorly graded SAND	SP	9.5	0.261	0.187	0.15	0.90	1.74

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

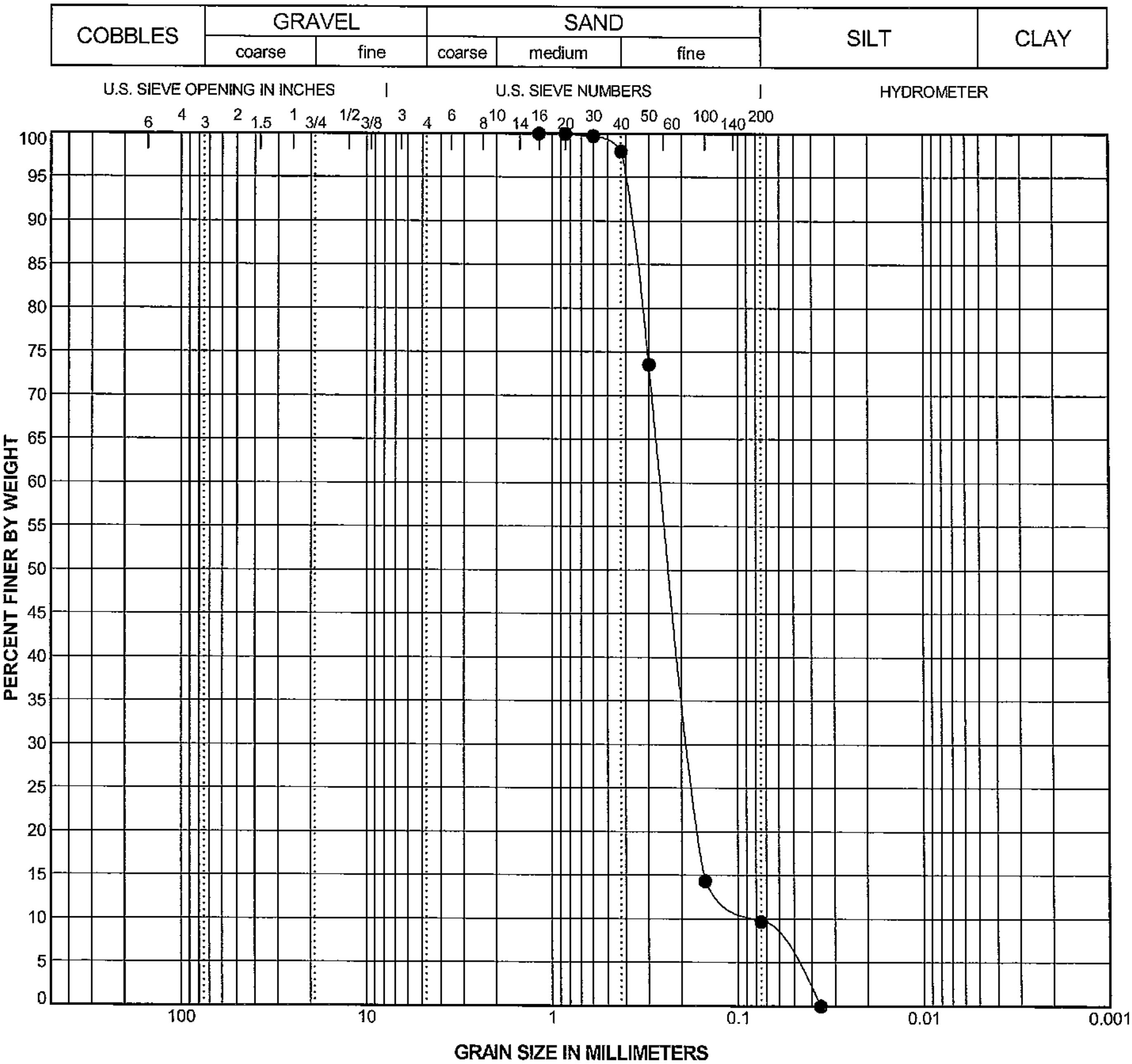
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 31431012l6 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-8T	20.0-22.0	Brown, clayey SAND	SC	1.18	0.256	0.18	0.078	1.62	3.26

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

Project: ATB / E-Pond Complex

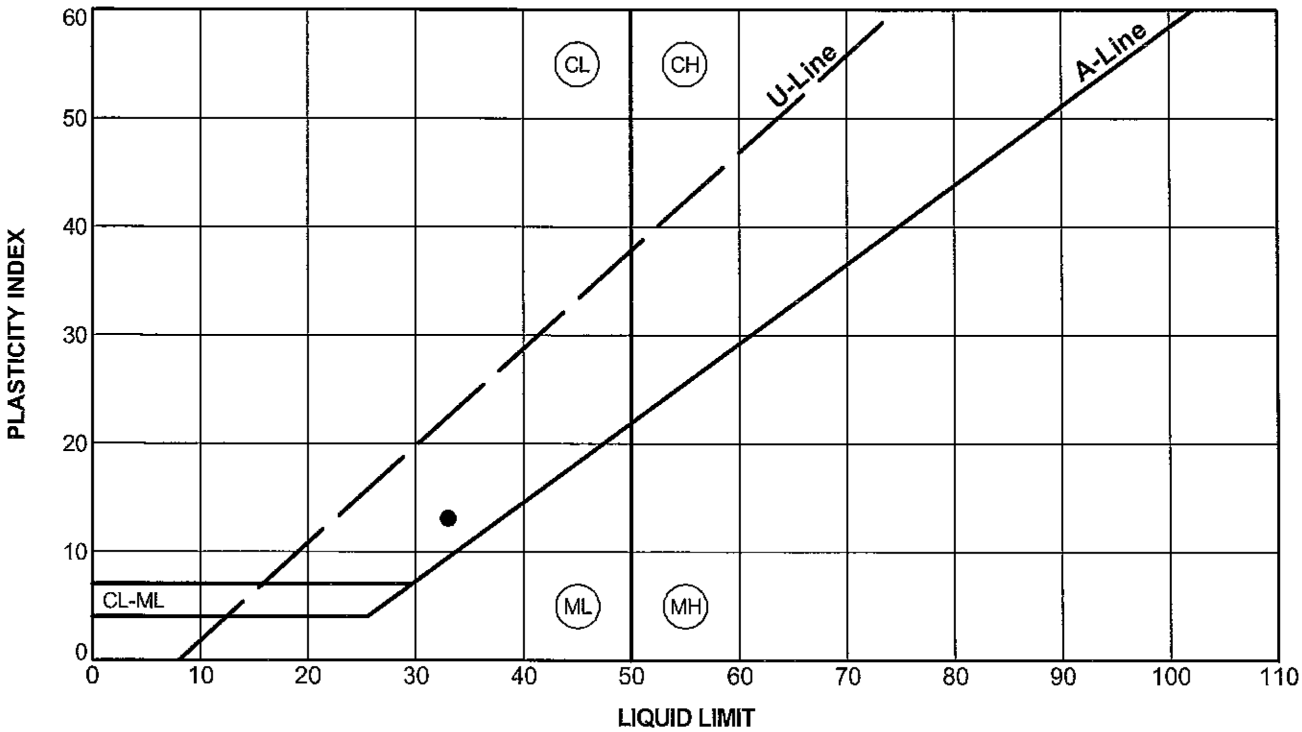
Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 3143101216 ATB EPOND.GPJ LAW_GIBB.GDT 2/22/10

ATTERBERG LIMITS TEST RESULTS



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-1C	10.0-12.0	33	20	13	16.3	-0.3	CL	Grayish brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

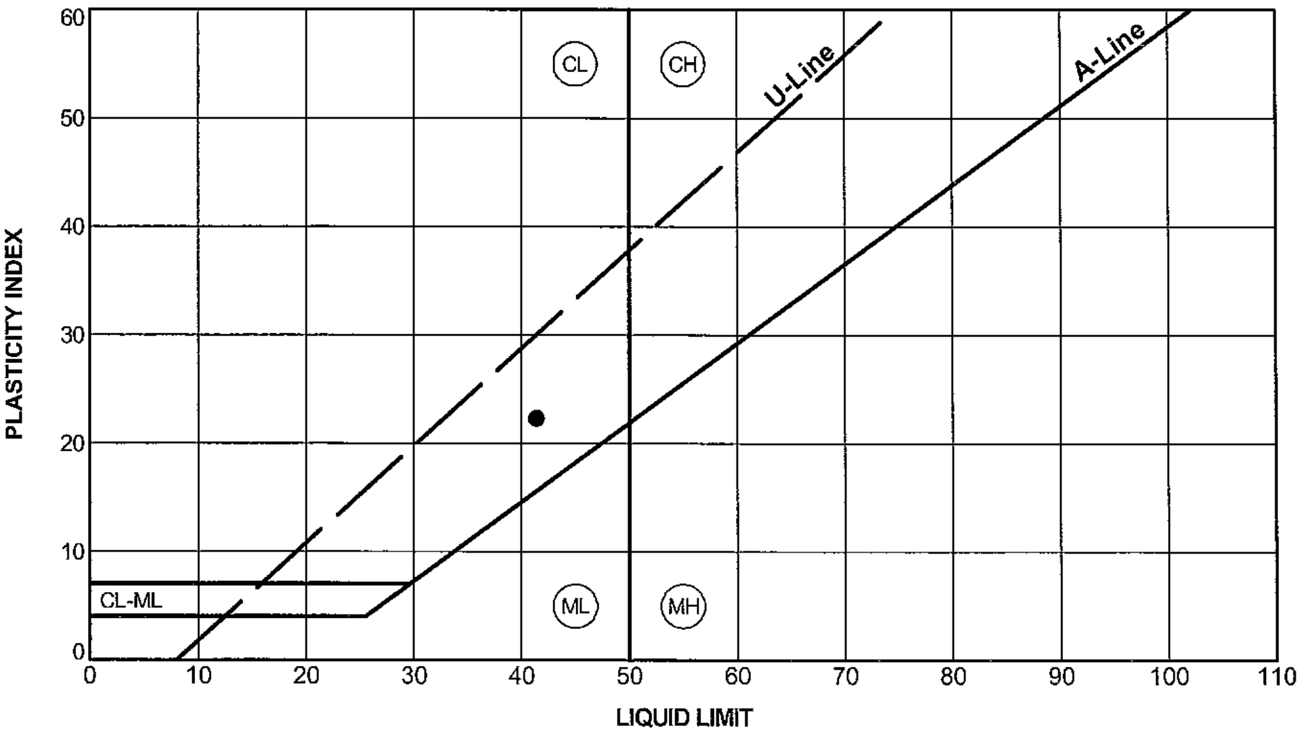
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-1T	10.0-12.0	41	19	22	22.0	0.1	CL	Brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

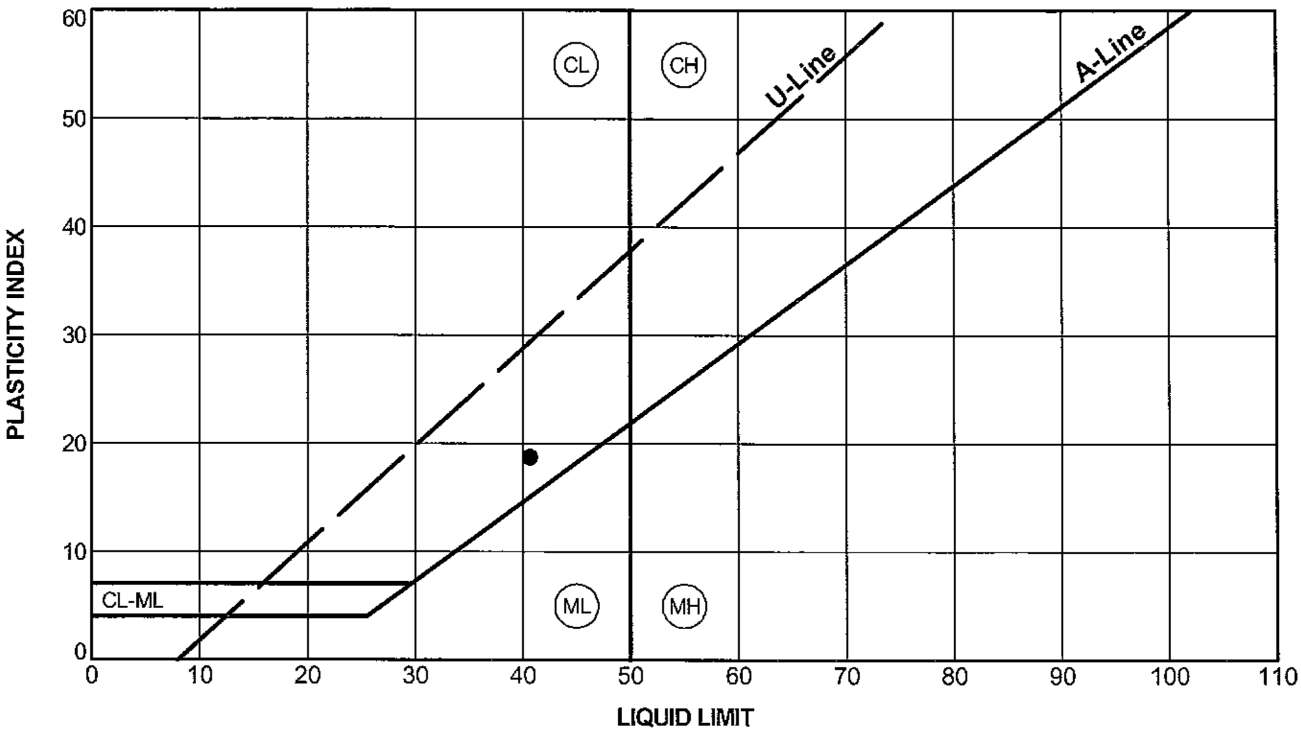
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: JdB

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-2C	5.0-7.0	41	22	19	14.5	-0.4	CL	Dark gray, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

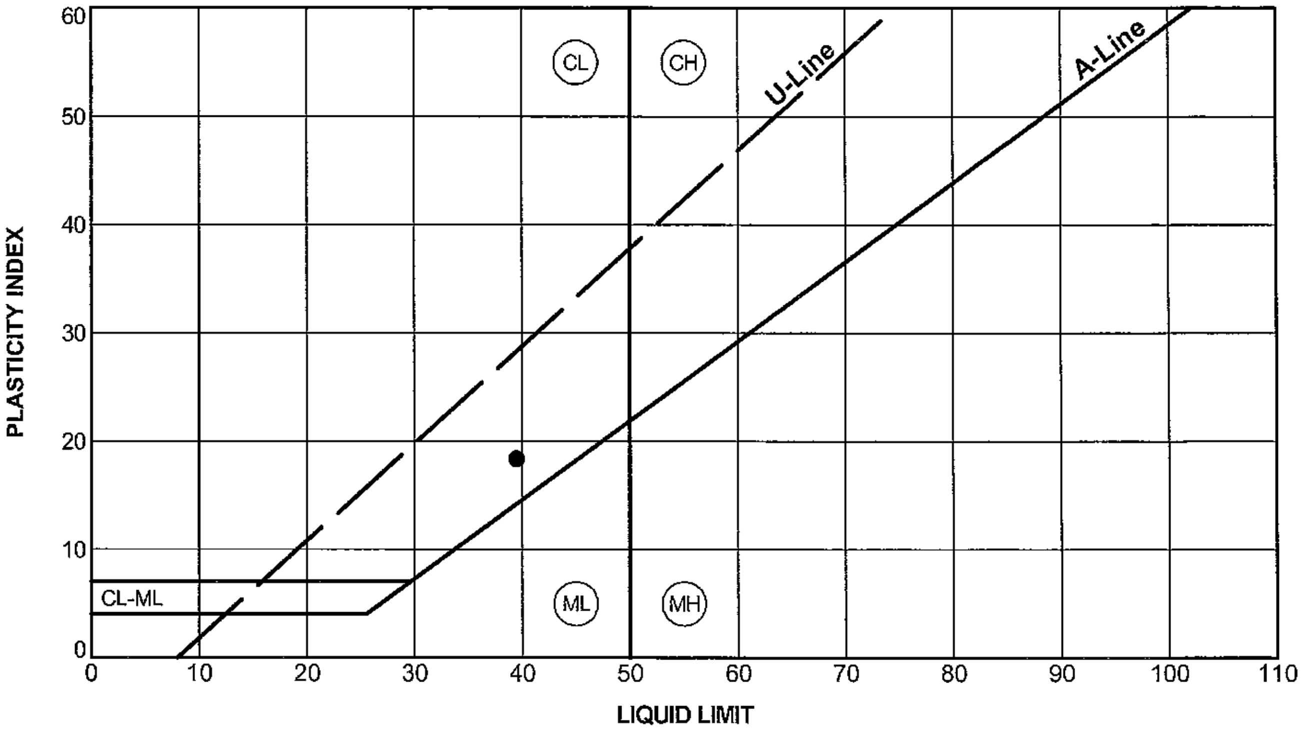
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: JdB

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-2C	15.0-17.0	39	21	18	19.9	-0.1	CL	Brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

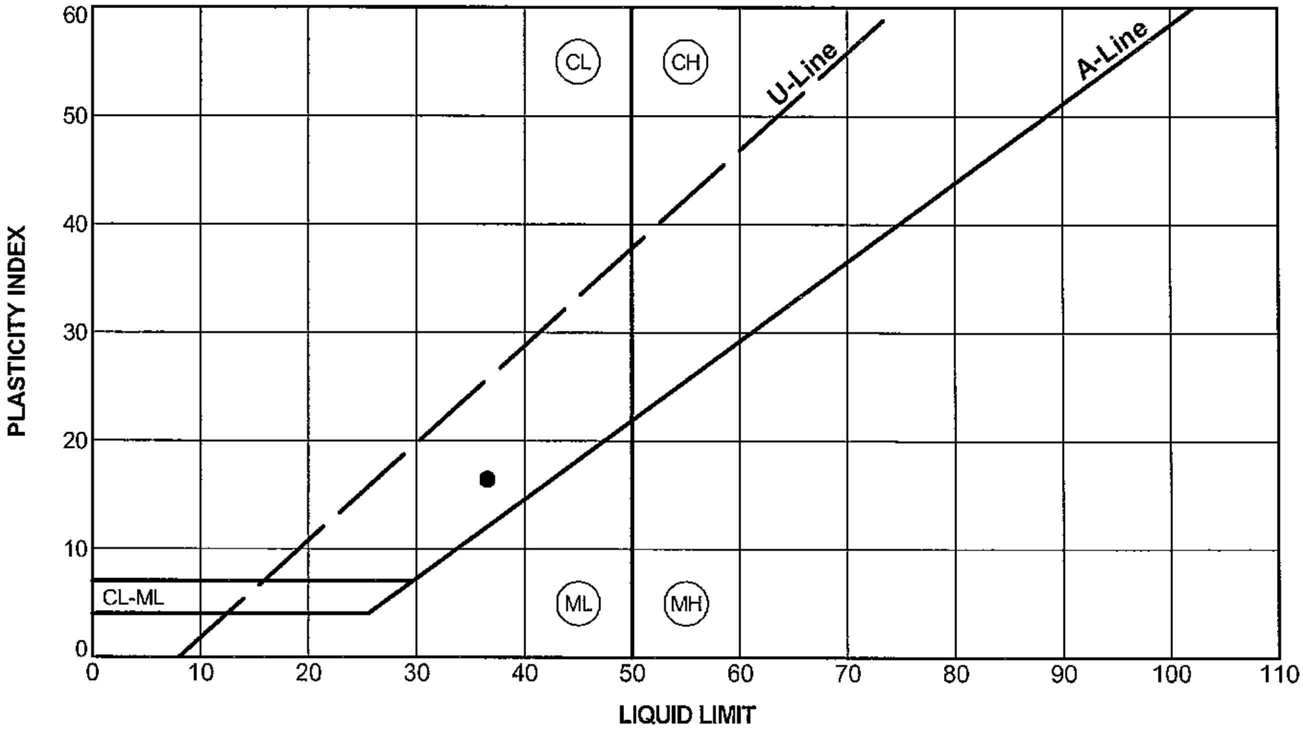
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [illegible]

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-3C	15.0-17.0	37	20	17	19.9	0.0	CL	Gray-brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

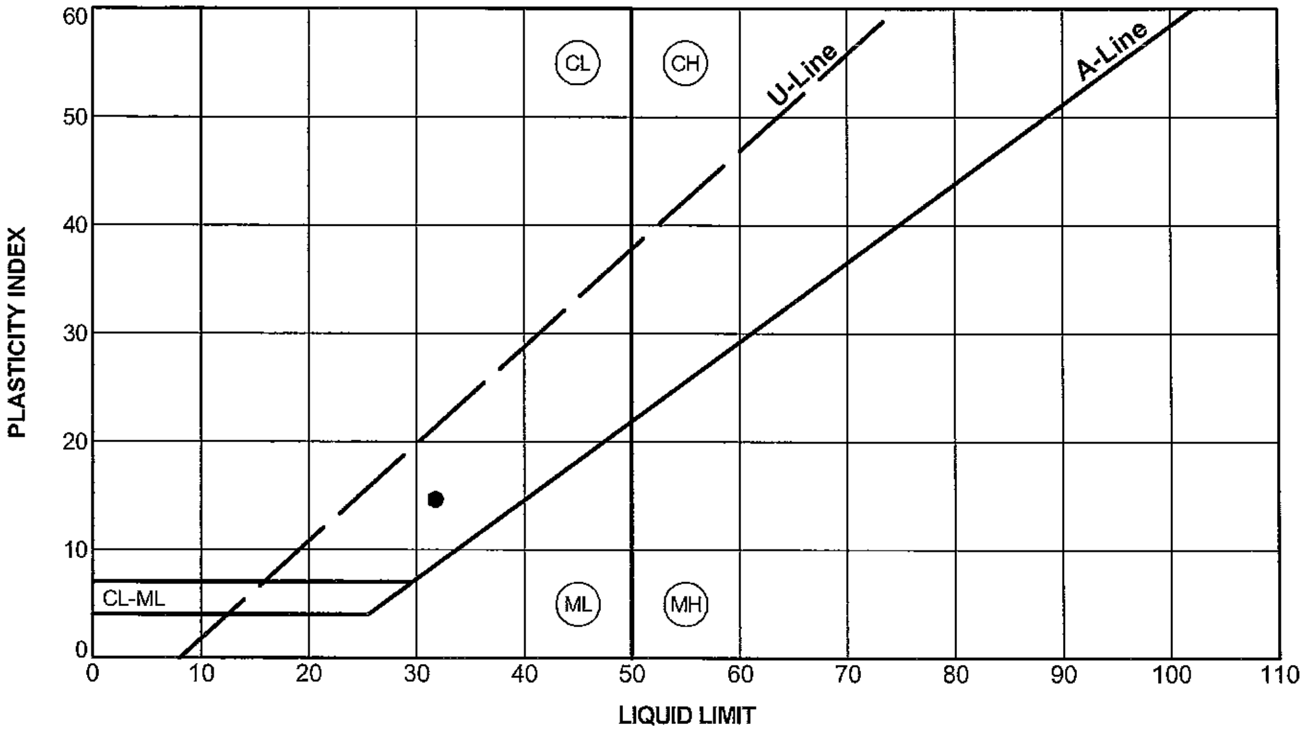
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-3T	5.0-7.0	32	17	15	21.0	0.3	CL	Brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

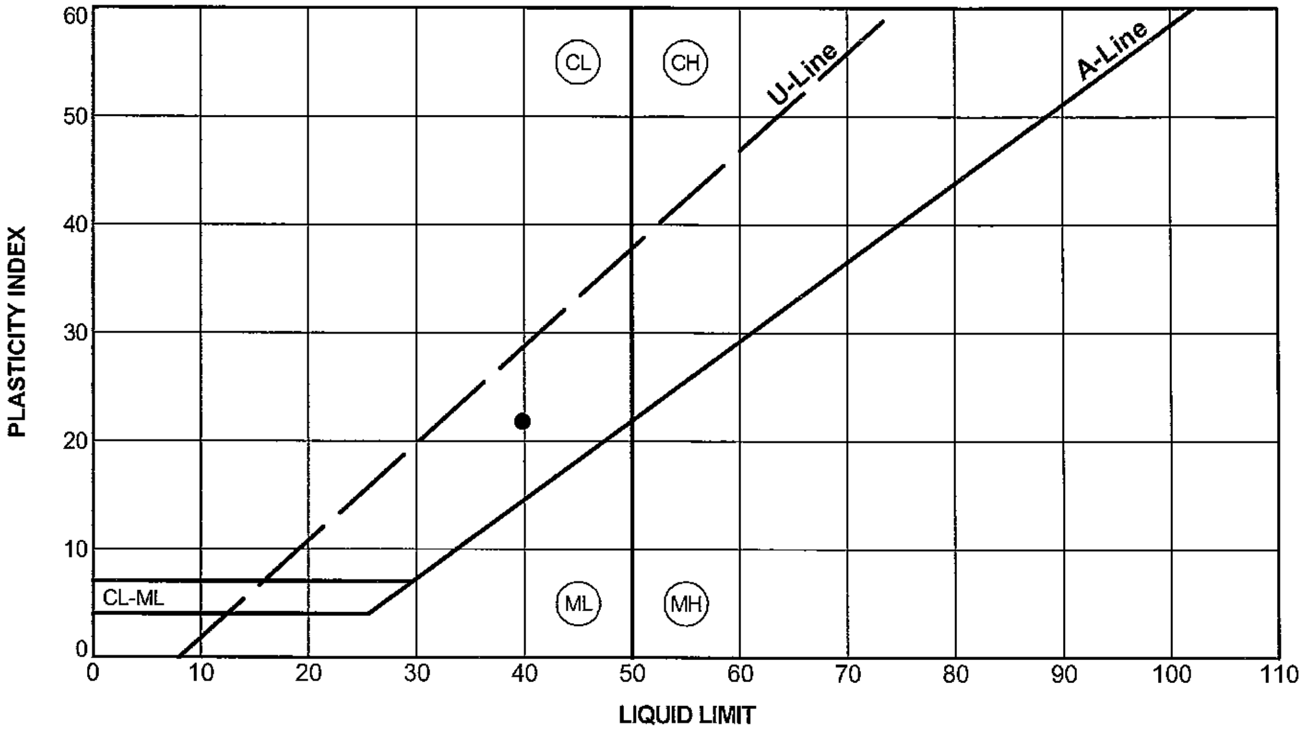
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-4C	10.0-12.0	40	18	22	19.3	0.1	CL	Brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

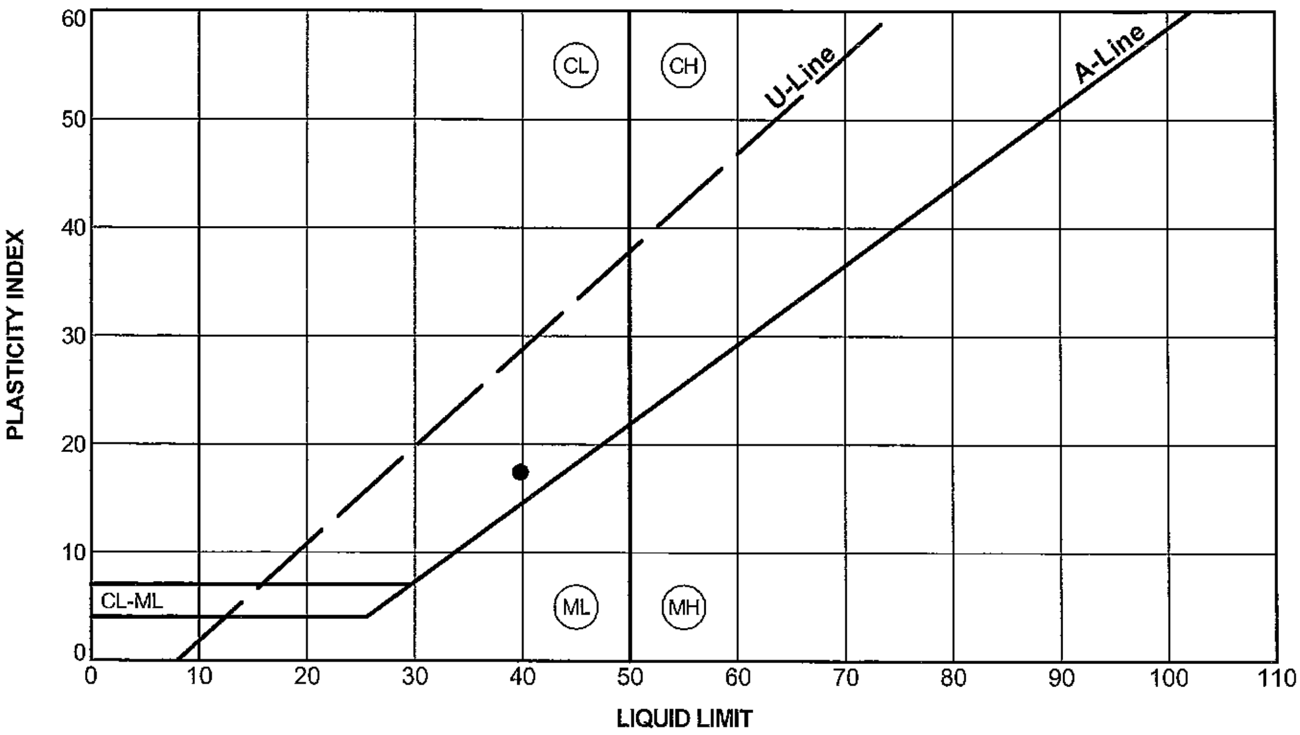
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: JAB

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-5C	13.5-15.0	40	22	18	20.9	-0.1	CL	Brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

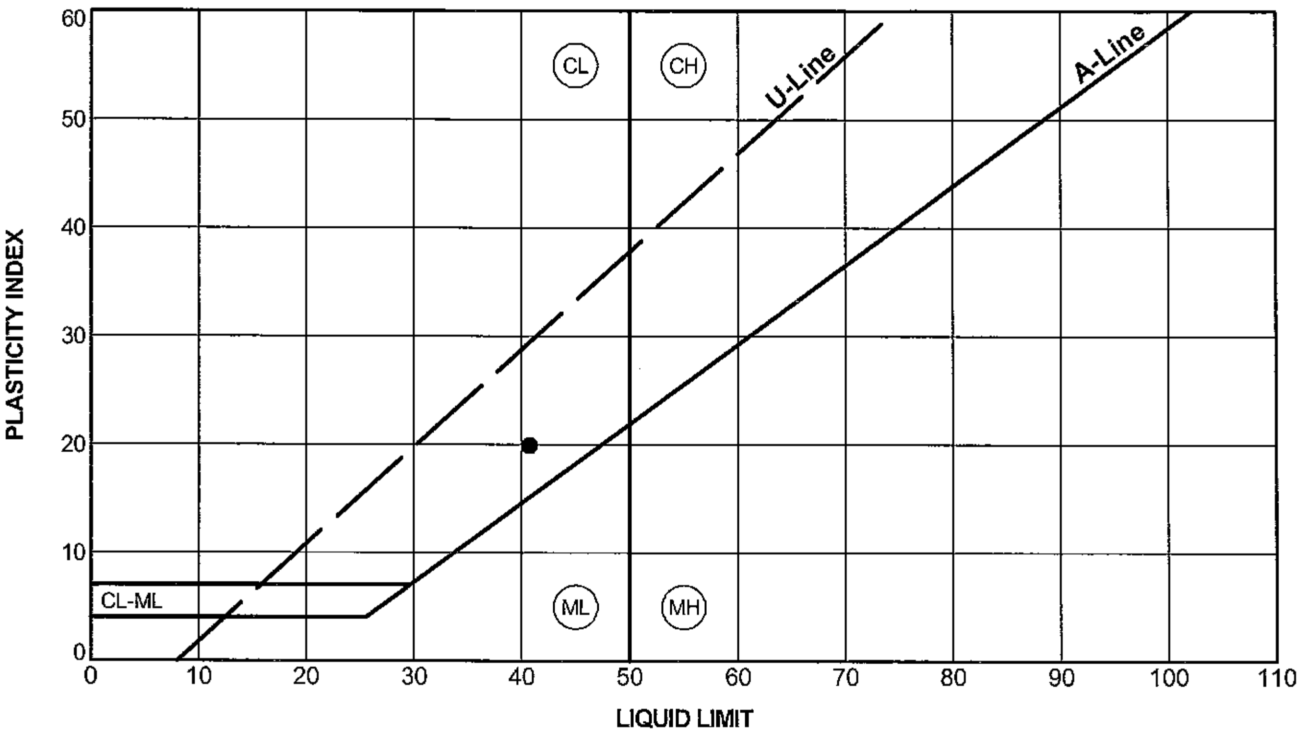
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By:

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-5C	15.0-17.0	41	21	20	22.9	0.1	CL	Brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

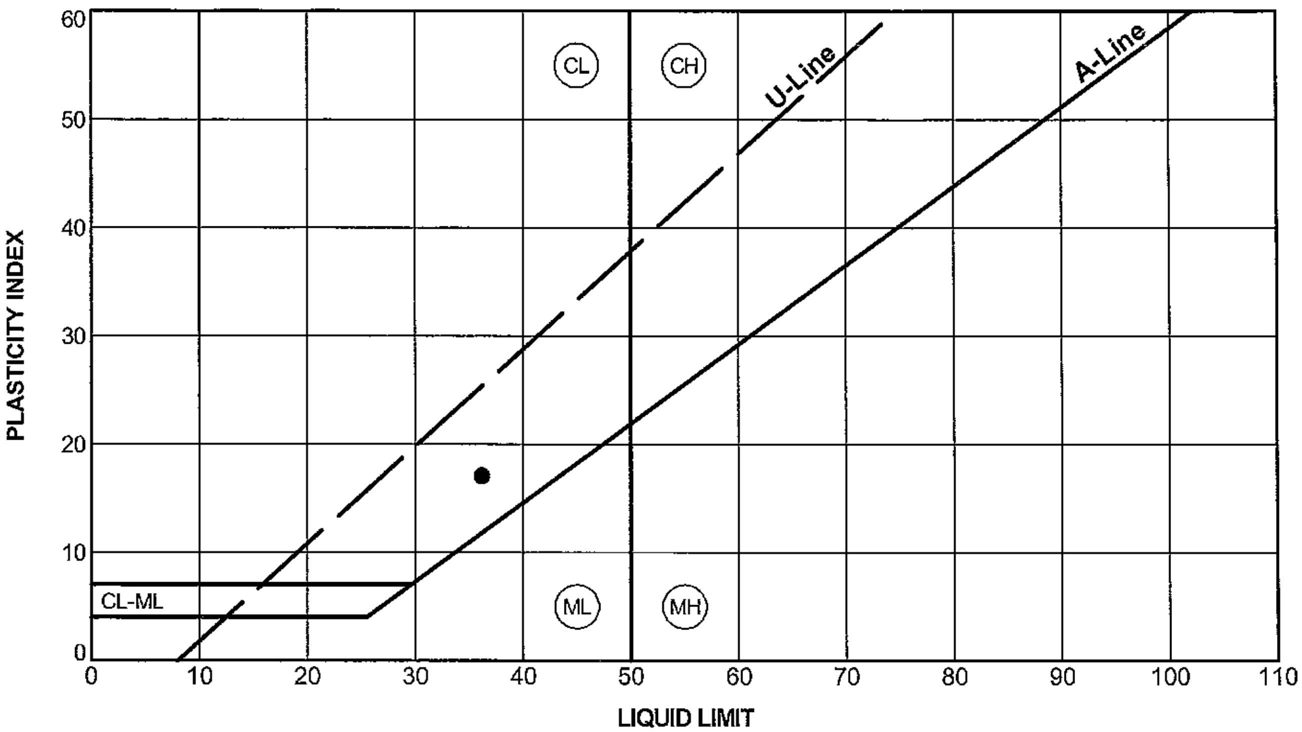
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: OB

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-6C	1.5-3.5	36	19	17	15.9	-0.2	CL	Brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

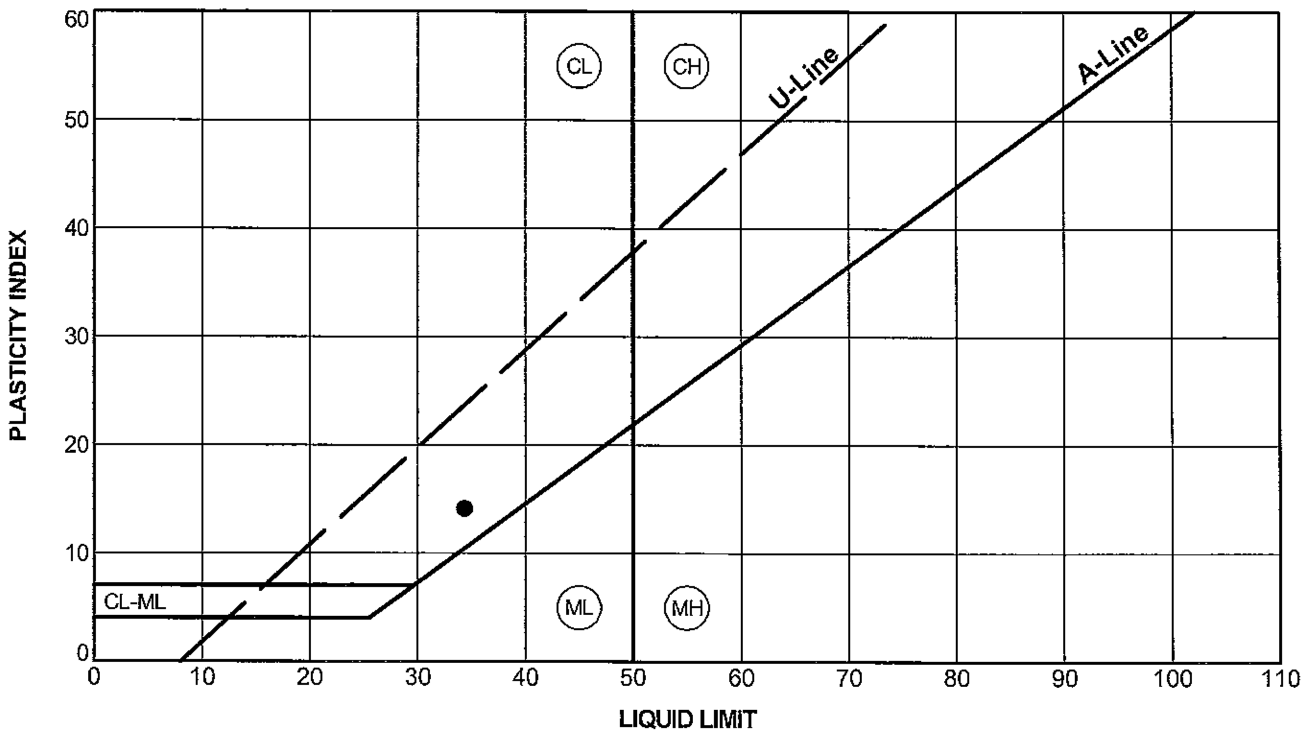
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: _____

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-6C	8.5-10.0	34	20	14	17.9	-0.2	CL	Brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

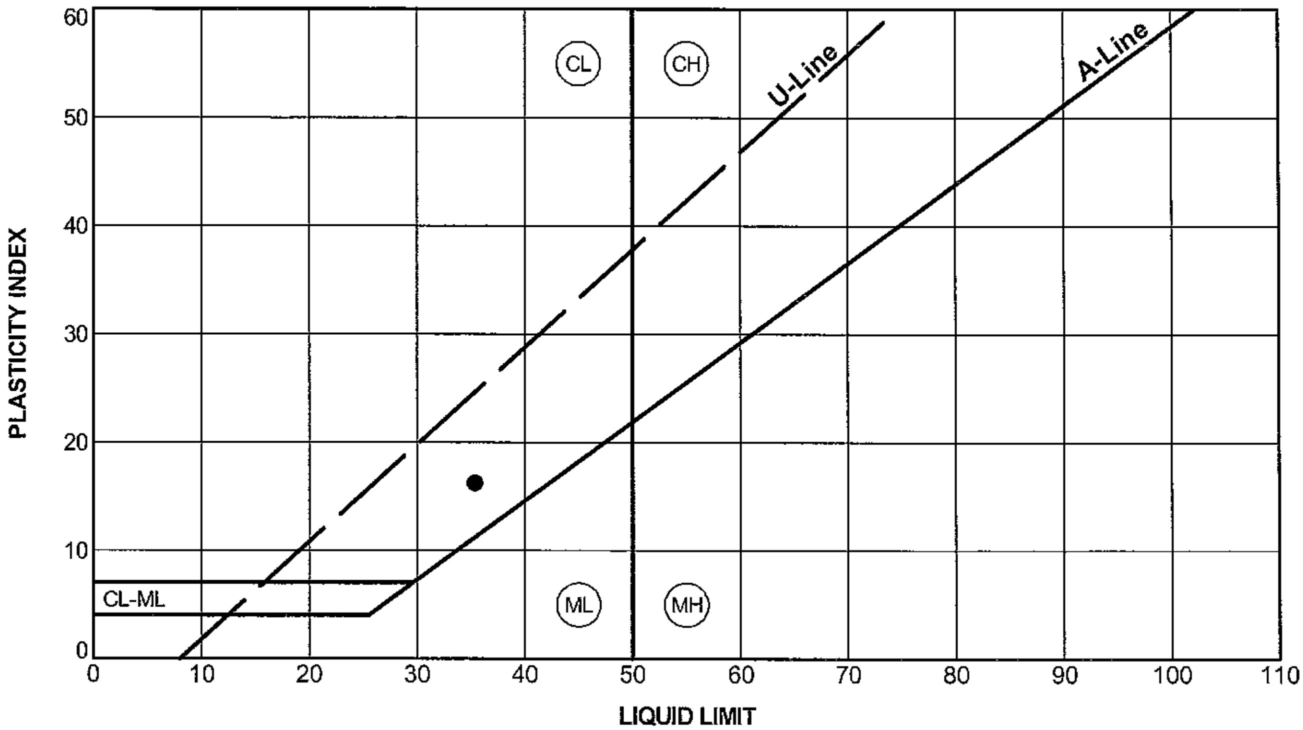
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: ADS

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-7C	5.0-7.0	35	19	16	16.5	-0.2	CL	Brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

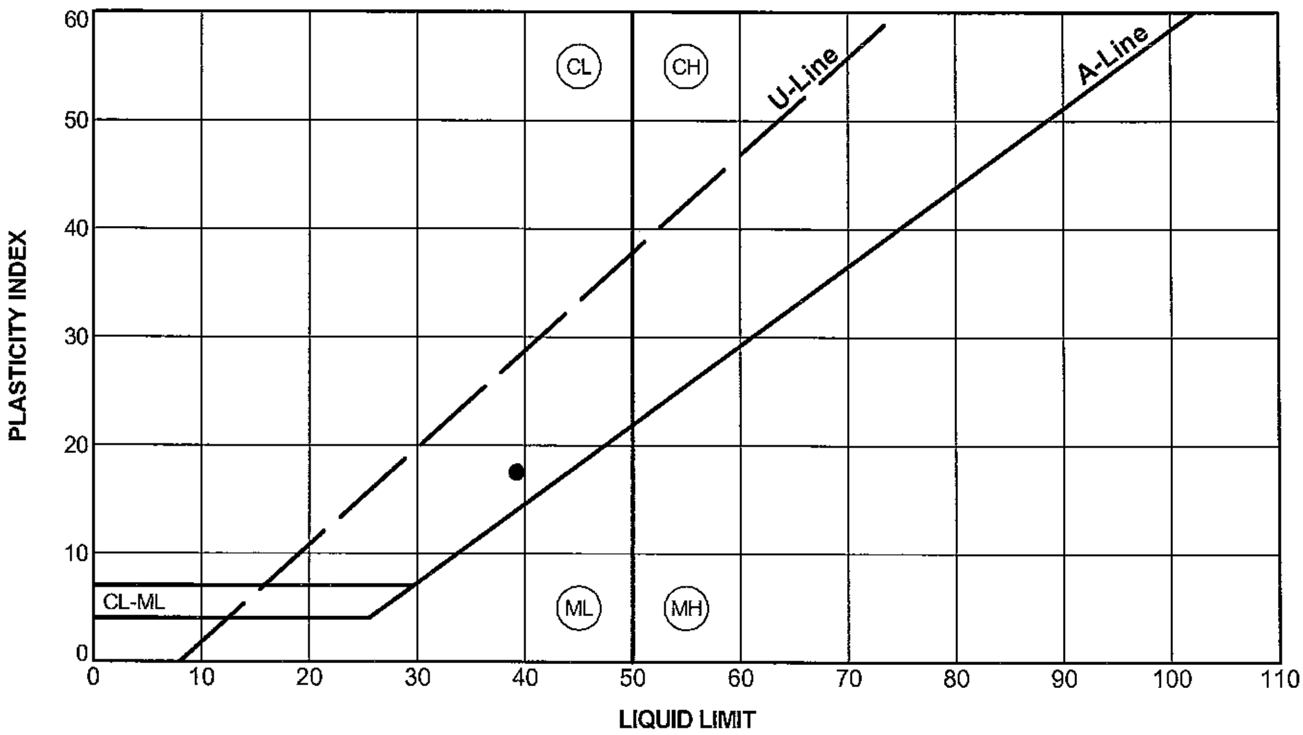
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: CAS

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-7C	15.0-17.0	39	22	17	22.1	0.0	CL	Gray, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

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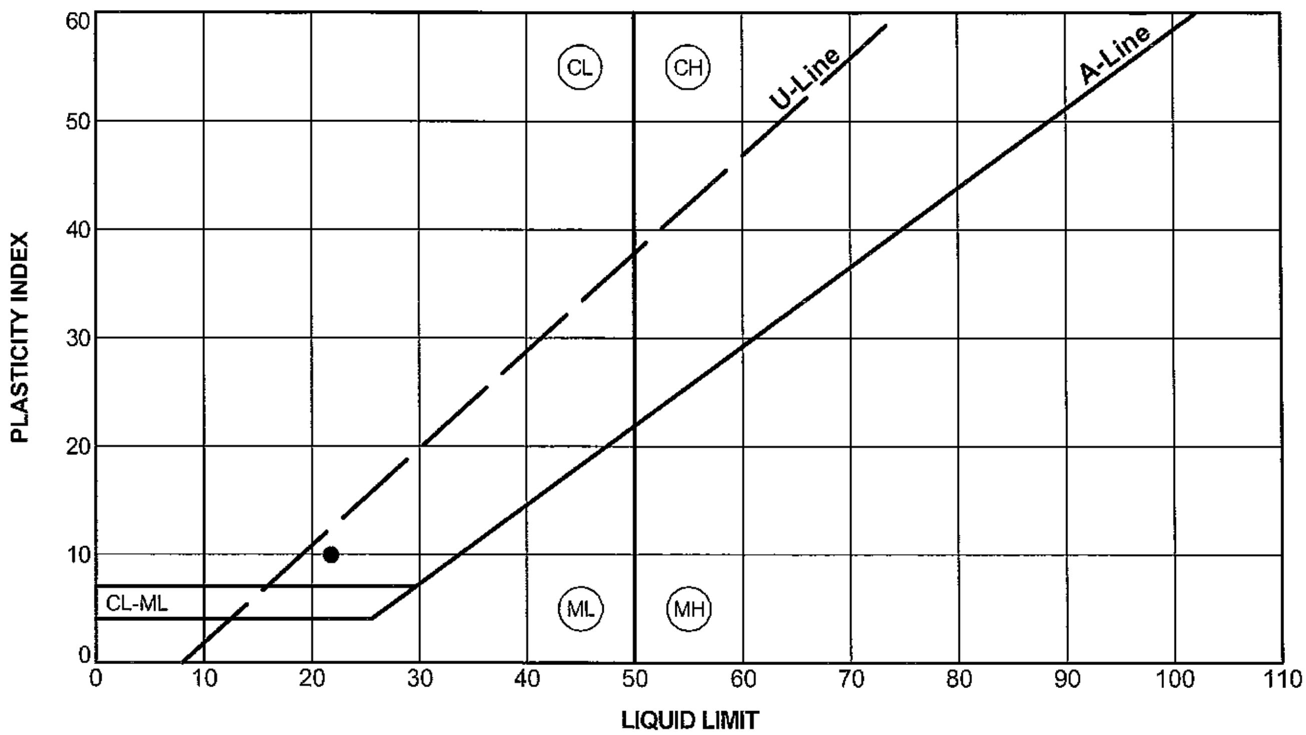
MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-7S	50.0-52.0	22	12	10	16.1	0.4	CL	Dark brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

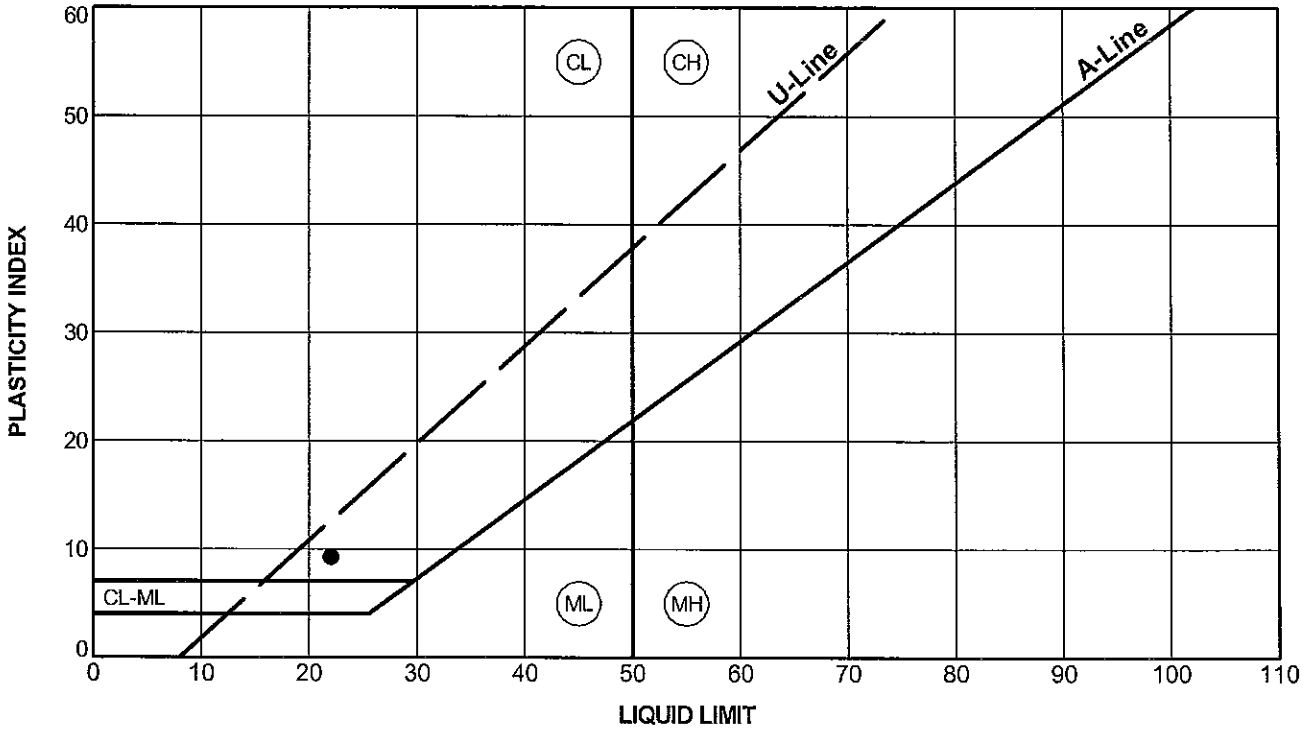
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-8C	10.0-12.0	22	13	9	13.1	0.0	CL	Dark brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

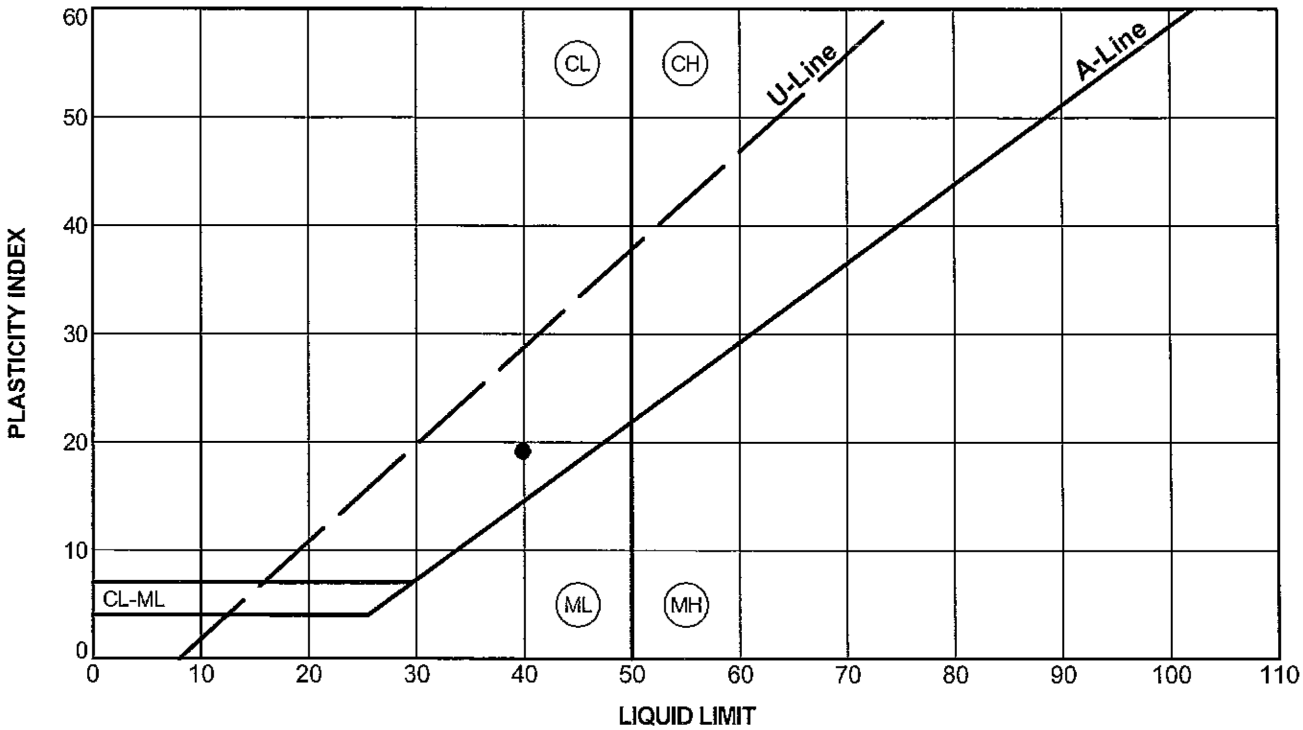
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: AB9

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-8C	20.0-22.0	40	21	19	20.6	0.0	CL	Brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

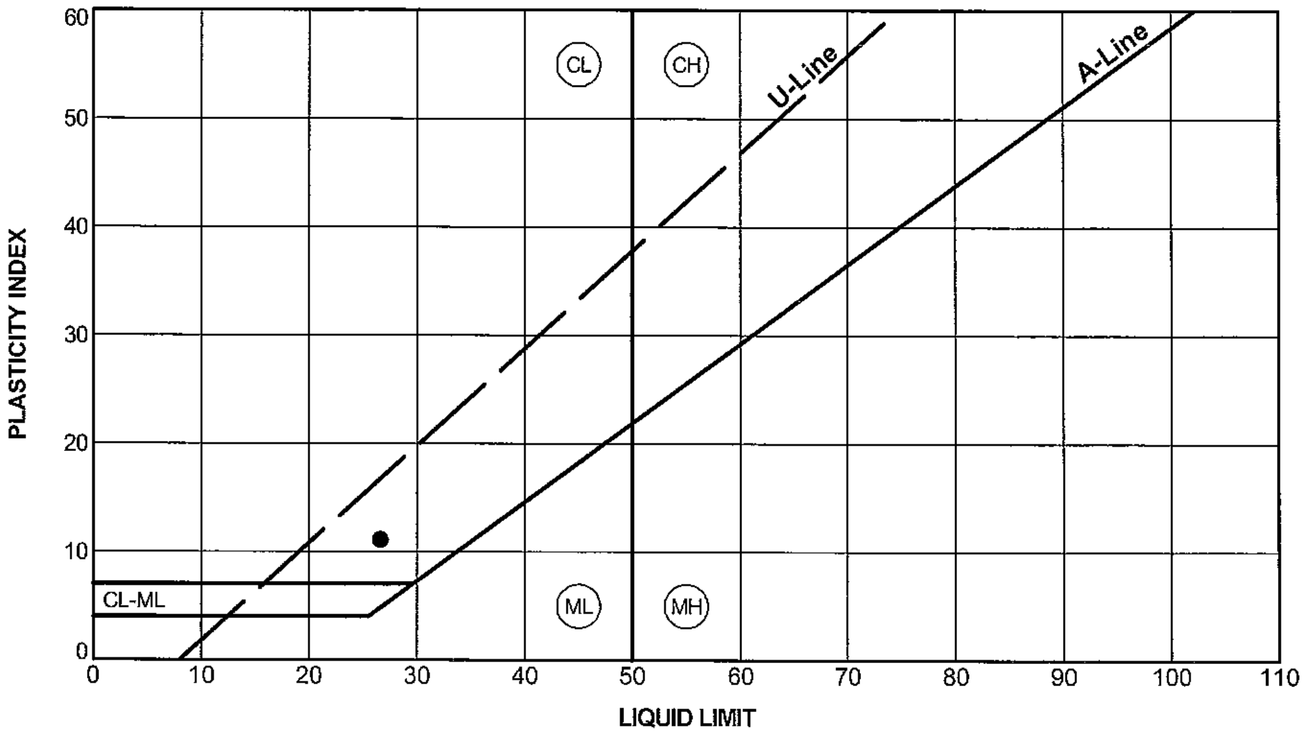
ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-8S	15.0-17.0	27	15	12	16.5	0.1	CL	Medium brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

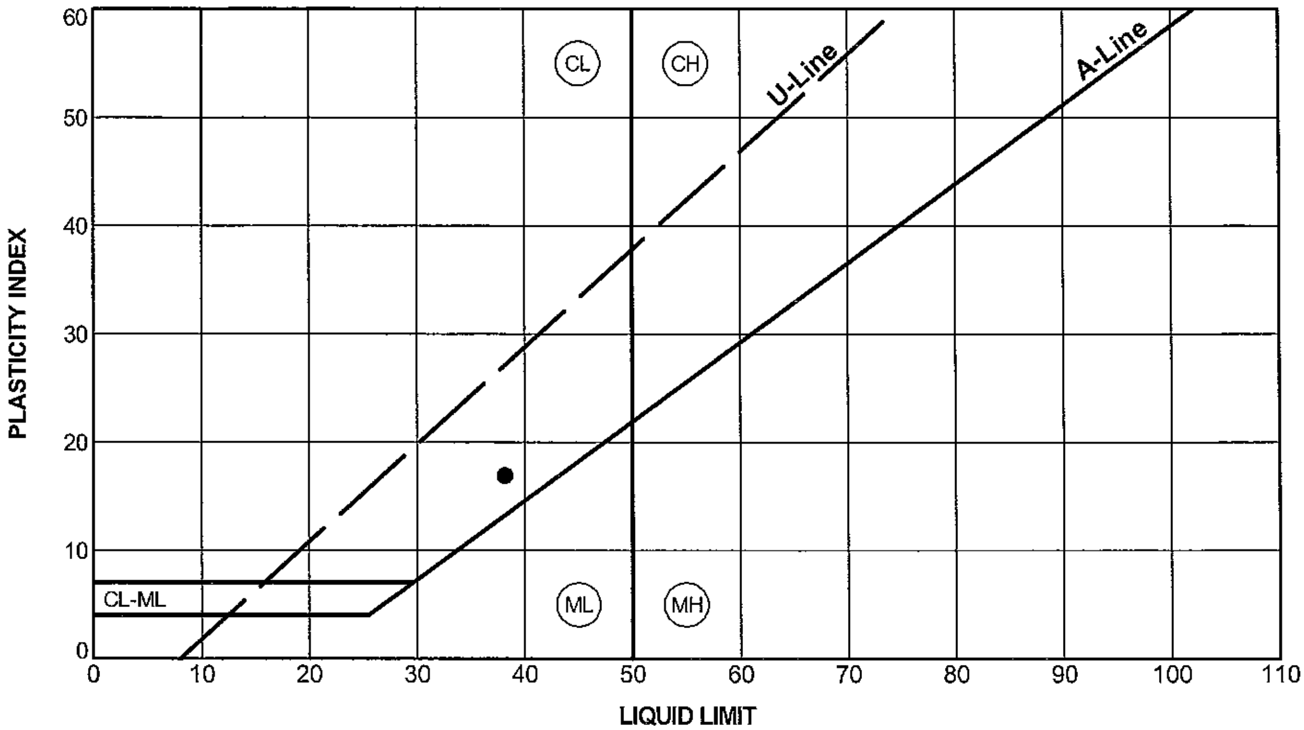
Project: ATB / E-Pond Complex

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-8T	5.0-7.0	38	21	17	26.5	0.3	CL	Brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

Project: ATB / E-Pond Complex

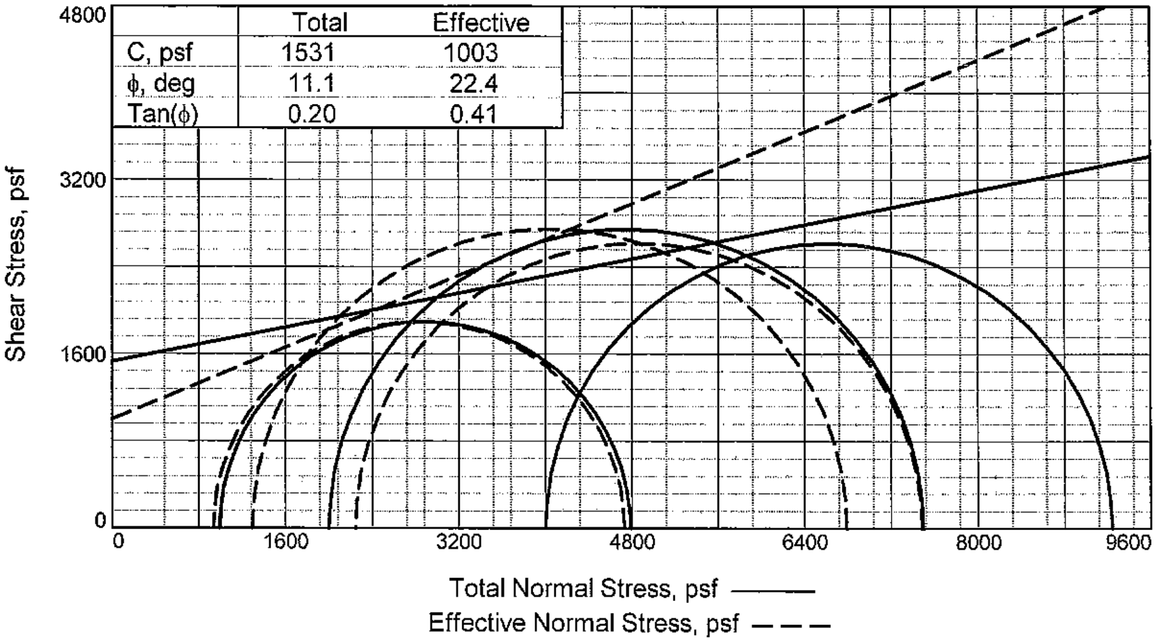
Project No: 3143-10-1216

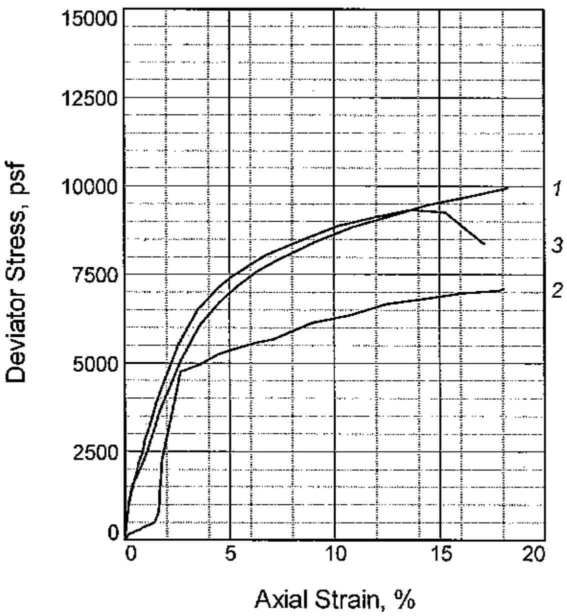
Checked By: [signature]

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 ATB EPOND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

TRIAXIAL SHEAR TEST RESULTS





	Sample No.	1	2	3
Initial	Water Content, %	14.5	19.9	17.3
	Dry Density, pcf	115.5	105.4	114.0
	Saturation, %	84.5	89.7	97.5
	Void Ratio	0.4653	0.5996	0.4782
	Diameter, in.	2.85	2.85	2.85
	Height, in.	5.53	5.62	5.94
At Test	Water Content, %	17.1	21.5	16.1
	Dry Density, pcf	115.6	106.6	117.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4637	0.5808	0.4351
	Diameter, in.	2.85	2.84	2.82
	Height, in.	5.53	5.60	5.88
	Strain rate, in./min.	0.00	0.00	0.00
	Back Pressure, psi	58.00	68.00	68.00
	Cell Pressure, psi	64.90	95.80	81.90
	Fail. Stress, psf	3793	5238	5497
	Total Pore Pr., psf	8410	11549	10498
	Ult. Stress, psf	3793	7104	9329
	Total Pore Pr., psf	8410	9950	7560
	$\bar{\sigma}_1$ Failure, psf	4729	7484	6793
	$\bar{\sigma}_3$ Failure, psf	936	2246	1296

Type of Test:
CU with Pore Pressures

Sample Type: UD

Description: Light Brown, lean CLAY (CL)

LL= 41 **PL=** 22 **PI=** 19

Specific Gravity= 2.71

Remarks:

Figure ________

Client: LG&E

Project: LG&E Cane Run Station

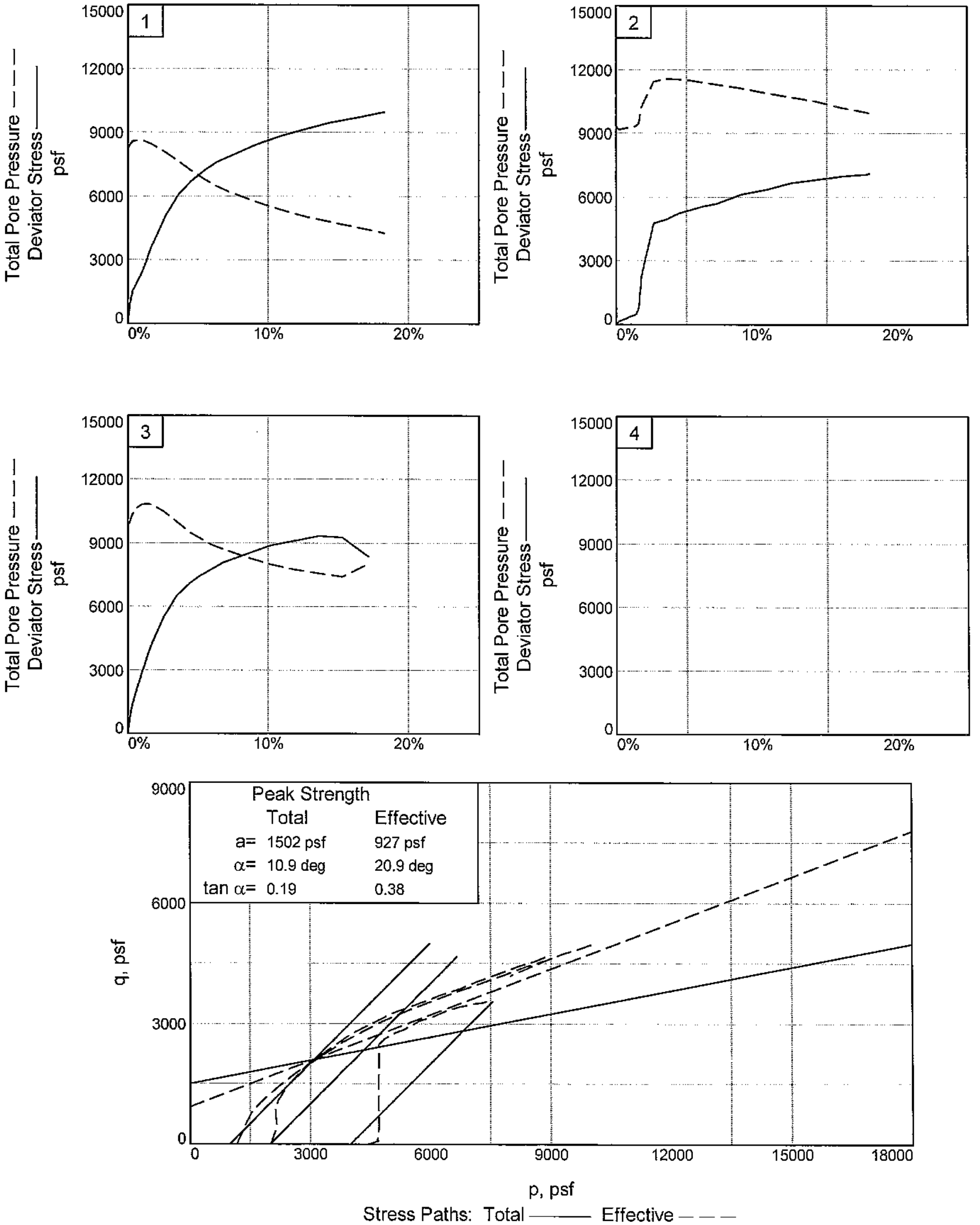
Location: ATB / E-Pond Complex

Sample Number: B-2C **Depth:** 5.0-7.0 Feet

Proj. No.: 3143-10-1216 **Date Sampled:**

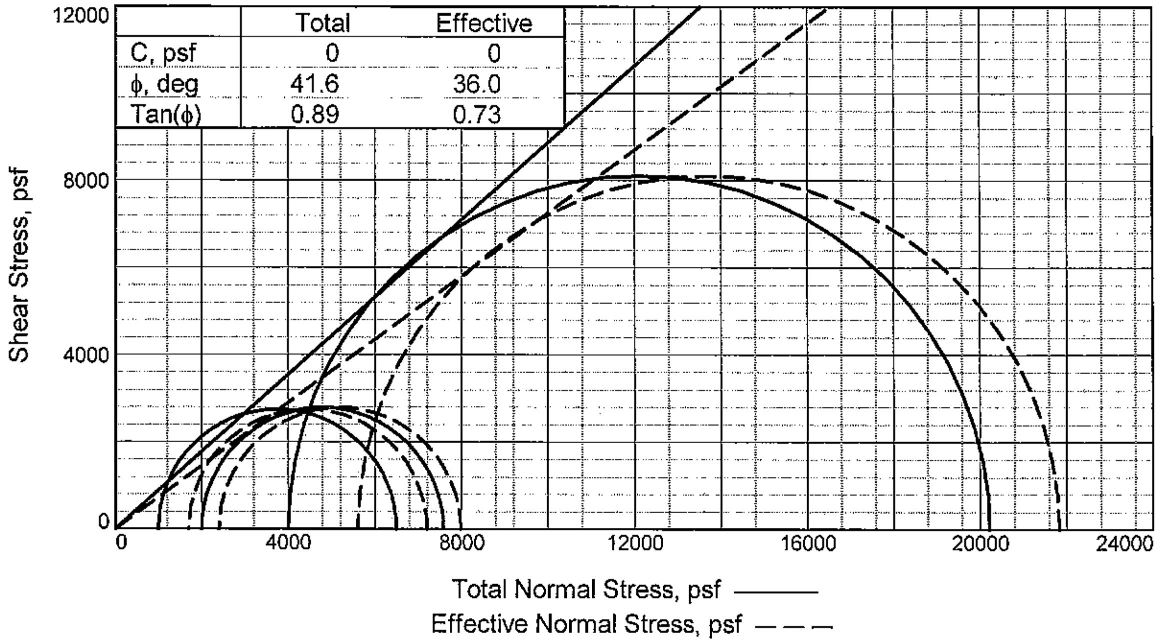
TRIAXIAL SHEAR TEST REPORT
MACTEC Engineering and Consulting, Inc.
Louisville, Kentucky

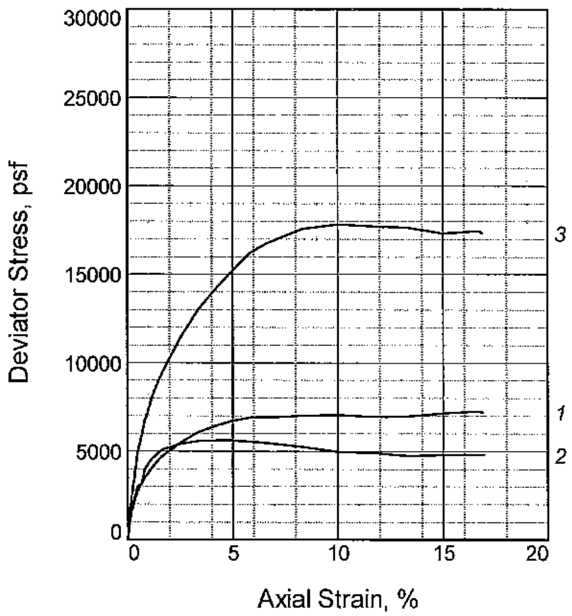
Tested By: Tony Oberhausen



Client: LG&E
Project: LG&E Cane Run Station
Location: ATB / E-Pond Complex **Depth:** 5.0-7.0 Feet **Sample Number:** B-2C
Project No.: 3143-10-1216 **Figure** ________ **MACTEC Engineering and Consulting, Inc.**

Tested By: Tony Oberhausen





Sample No.		1	2	3
Initial	Water Content, %	7.7	7.3	8.1
	Dry Density, pcf	83.6	83.8	83.2
	Saturation, %	20.7	19.9	21.3
	Void Ratio	0.9785	0.9744	1.0260
	Diameter, in.	2.86	2.86	2.86
	Height, in.	6.00	6.00	6.00
At Test	Water Content, %	36.2	35.2	37.6
	Dry Density, pcf	84.5	85.5	83.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.9588	0.9341	1.0149
	Diameter, in.	2.85	2.84	2.85
	Height, in.	5.98	5.96	5.99
Strain rate, in./min.		0.03	0.03	0.01
Back Pressure, psi		28.00	28.00	48.00
Cell Pressure, psi		34.90	41.90	75.80
Fail. Stress, psf		5500	5579	16226
Total Pore Pr., psf		3326	3629	5314
Ult. Stress, psf		7291	5611	15368
Total Pore Pr., psf		2290	3571	5573
$\bar{\sigma}_1$ Failure, psf		7199	7983	21828
$\bar{\sigma}_3$ Failure, psf		1699	2405	5602

Type of Test:
CU with Pore Pressures

Sample Type: Remold

Description: Brown, poorly graded SAND (SP)

Specific Gravity= 2.65

Remarks:

Figure ______

Client: LG&E

Project: LG&E Cane Run Station

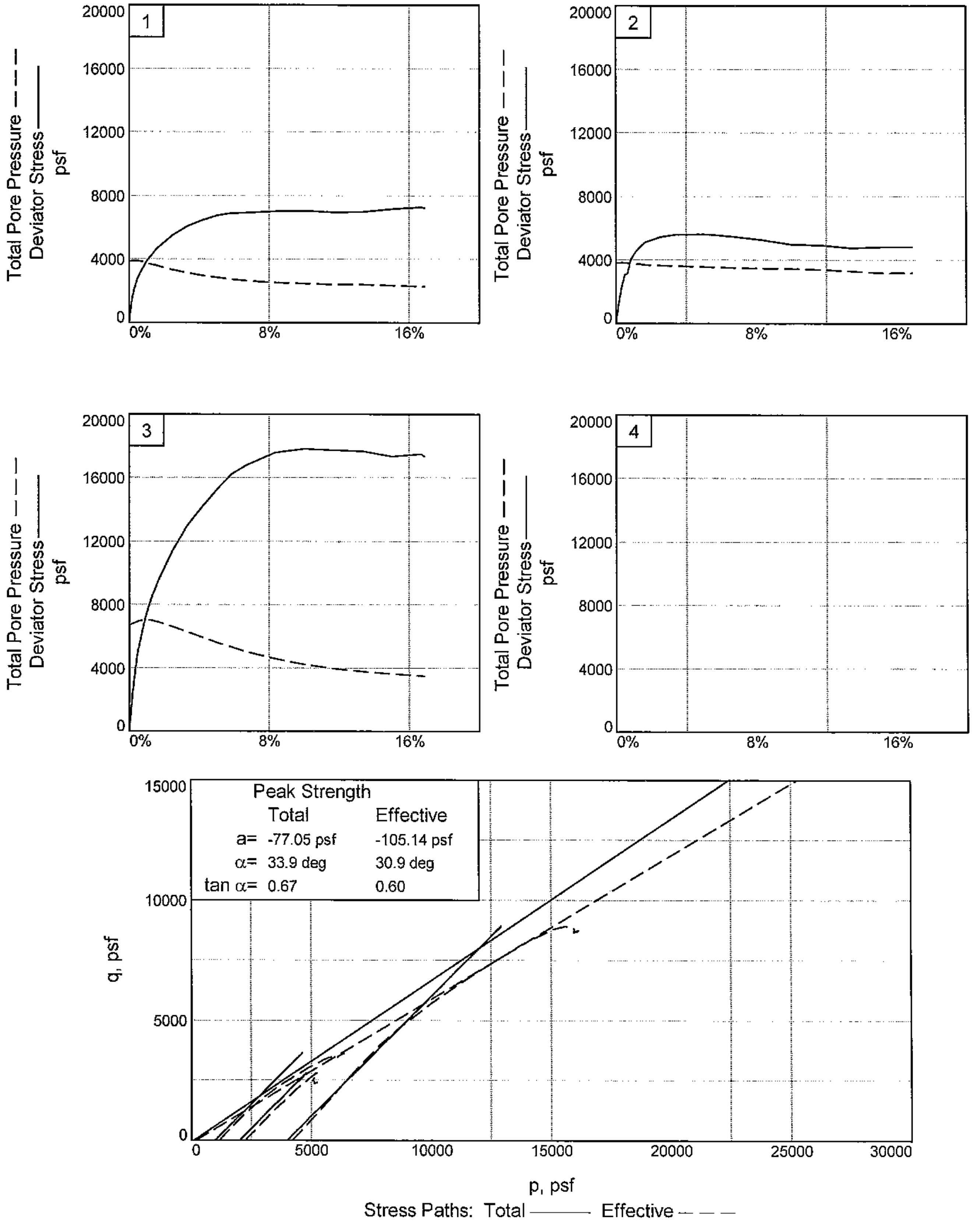
Location: ATB / E-Pond Complex

Sample Number: B-4C **Depth:** 25.0-27.0 Feet

Proj. No.: 3143-10-1216 **Date Sampled:** 02.02.10

TRIAXIAL SHEAR TEST REPORT
MACTEC Engineering and Consulting, Inc.
Louisville, Kentucky

Tested By: Tony Oberhausen



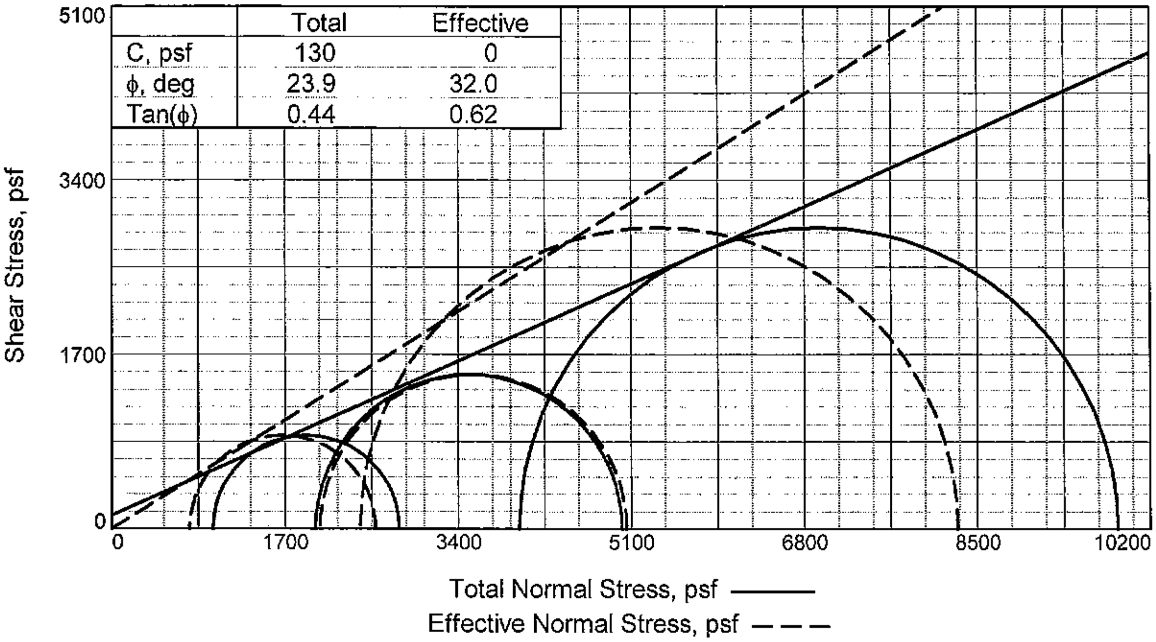
Client: LG&E

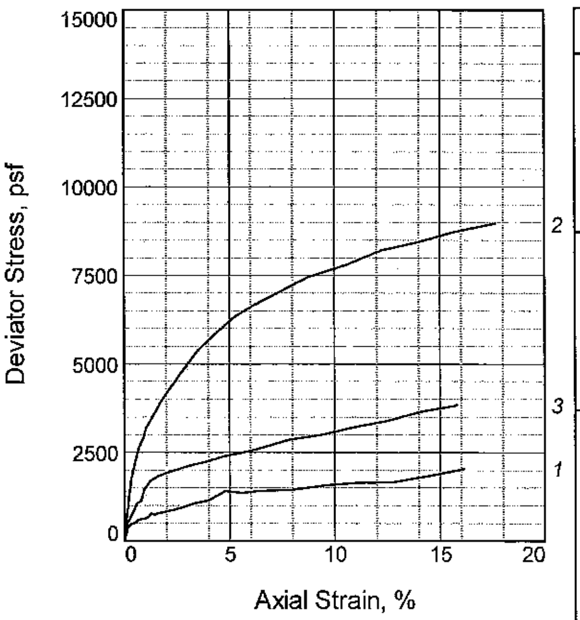
Project: LG&E Cane Run Station

Location: ATB / E-Pond Complex **Depth:** 25.0-27.0 Feet **Sample Number:** B-4C

Project No.: 3143-10-1216 **Figure** ________ **MACTEC Engineering and Consulting, Inc.**

Tested By: Tony Oberhausen





Sample No.		1	2	3
Initial	Water Content, %	21.2	20.3	13.6
	Dry Density, pcf	105.4	108.0	112.4
	Saturation, %	96.1	98.4	74.2
	Void Ratio	0.5934	0.5550	0.4942
	Diameter, in.	2.87	2.85	2.87
	Height, in.	6.28	5.77	6.39
At Test	Water Content, %	21.6	19.2	18.0
	Dry Density, pcf	106.3	110.7	113.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5805	0.5172	0.4837
	Diameter, in.	2.86	2.83	2.87
	Height, in.	6.26	5.73	6.38
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		48.00	62.00	73.00
Cell Pressure, psi		54.90	89.80	86.90
Fail. Stress, psf		1824	5877	3012
Total Pore Pr., psf		7142	10498	10469
Ult. Stress, psf		1582	8971	1567
Total Pore Pr., psf		7128	8554	10973
$\bar{\sigma}_1$ Failure, psf		2588	8311	5057
$\bar{\sigma}_3$ Failure, psf		763	2434	2045

Type of Test:
CU with Pore Pressures

Sample Type: UD

Description: Brown, silty, lean CLAY (CL)

Specific Gravity= 2.69

Remarks:

Figure ________

Client: LG&E

Project: LG&E Cane Run Station

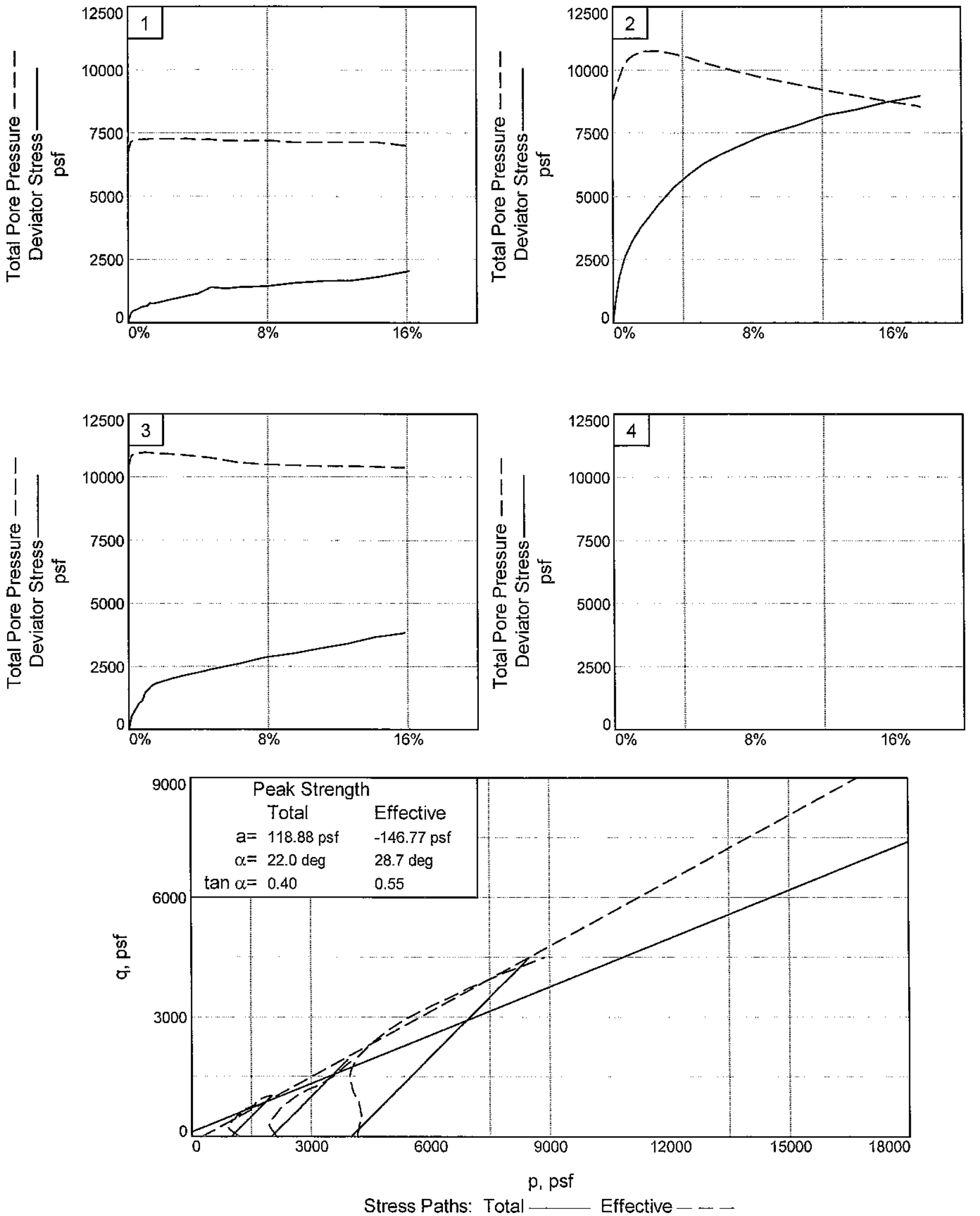
Location: ATB / E-Pond Complex

Sample Number: B-4C **Depth:** 10.0-12.0 Feet

Proj. No.: 3143-10-1216 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
MACTEC Engineering and Consulting, Inc.
Louisville, Kentucky

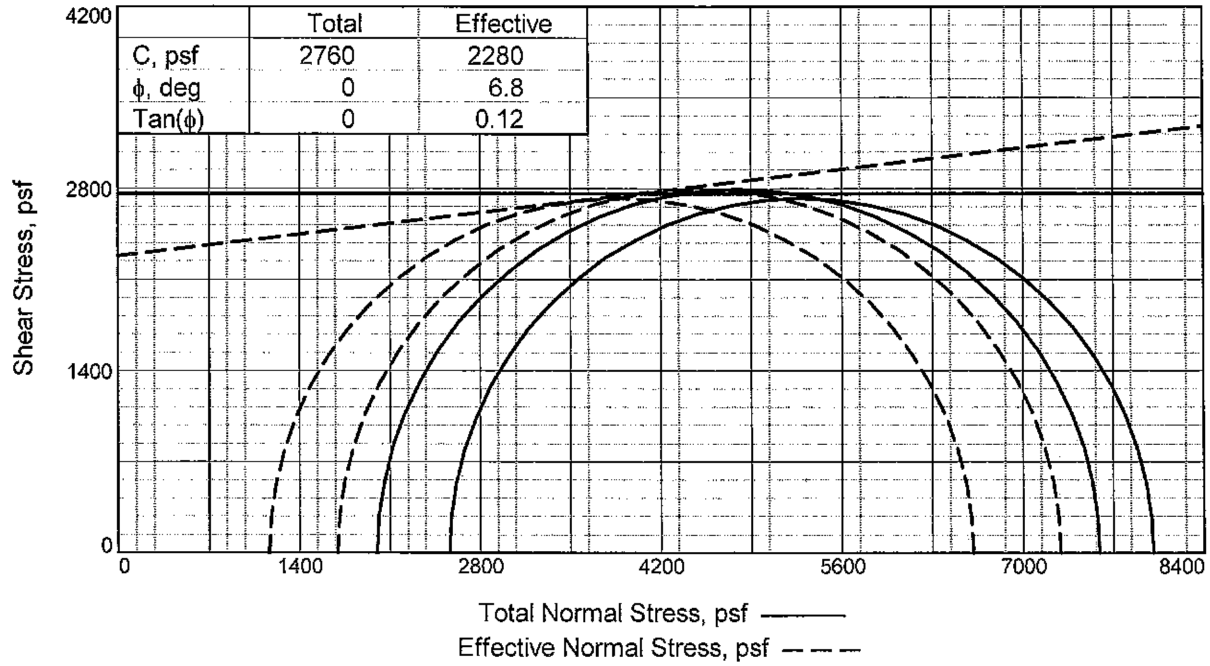
Tested By: Tony Oberhausen

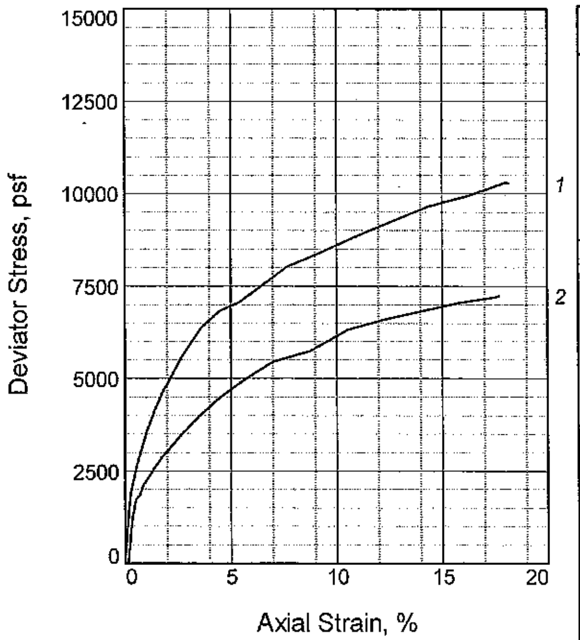


Client: LG&E
Project: LG&E Cane Run Station
Location: ATB / E-Pond Complex **Depth:** 10.0-12.0 Feet **Sample Number:** B-4C
Project No.: 3143-10-1216 **Figure** ________

MACTEC Engineering and Consulting, Inc.

Tested By: Tony Oberhausen





	Sample No.	1	2
Initial	Water Content, %	11.8	13.1
	Dry Density, pcf	127.5	124.1
	Saturation, %	99.9	99.7
	Void Ratio	0.3175	0.3529
	Diameter, in.	2.85	2.85
	Height, in.	5.57	5.73
At Test	Water Content, %	11.5	12.5
	Dry Density, pcf	128.4	125.6
	Saturation, %	100.0	100.0
	Void Ratio	0,3083	0.3373
	Diameter, in.	2.84	2.84
	Height, in.	5.56	5.71
	Strain rate, in./min.	0.00	0.02
	Back Pressure, psi	68.00	48.00
	Cell Pressure, psi	81.90	65.80
	Fail. Stress, psf	5591	5448
	Total Pore Pr., psf	10094	8309
	Ult. Stress, psf	10300	2256
	Total Pore Pr., psf	7315	7877
	$\bar{\sigma}_1$ Failure, psf	7290	6614
	$\bar{\sigma}_3$ Failure, psf	1699	1166

Type of Test:
CU with Pore Pressures

Sample Type: UD

Description: Brown, sandy lean CLAY (CL)

LL= 22 **PL=** 13 **PI=** 9

Specific Gravity= 2.69

Remarks:

Figure _______

Client: LG&E

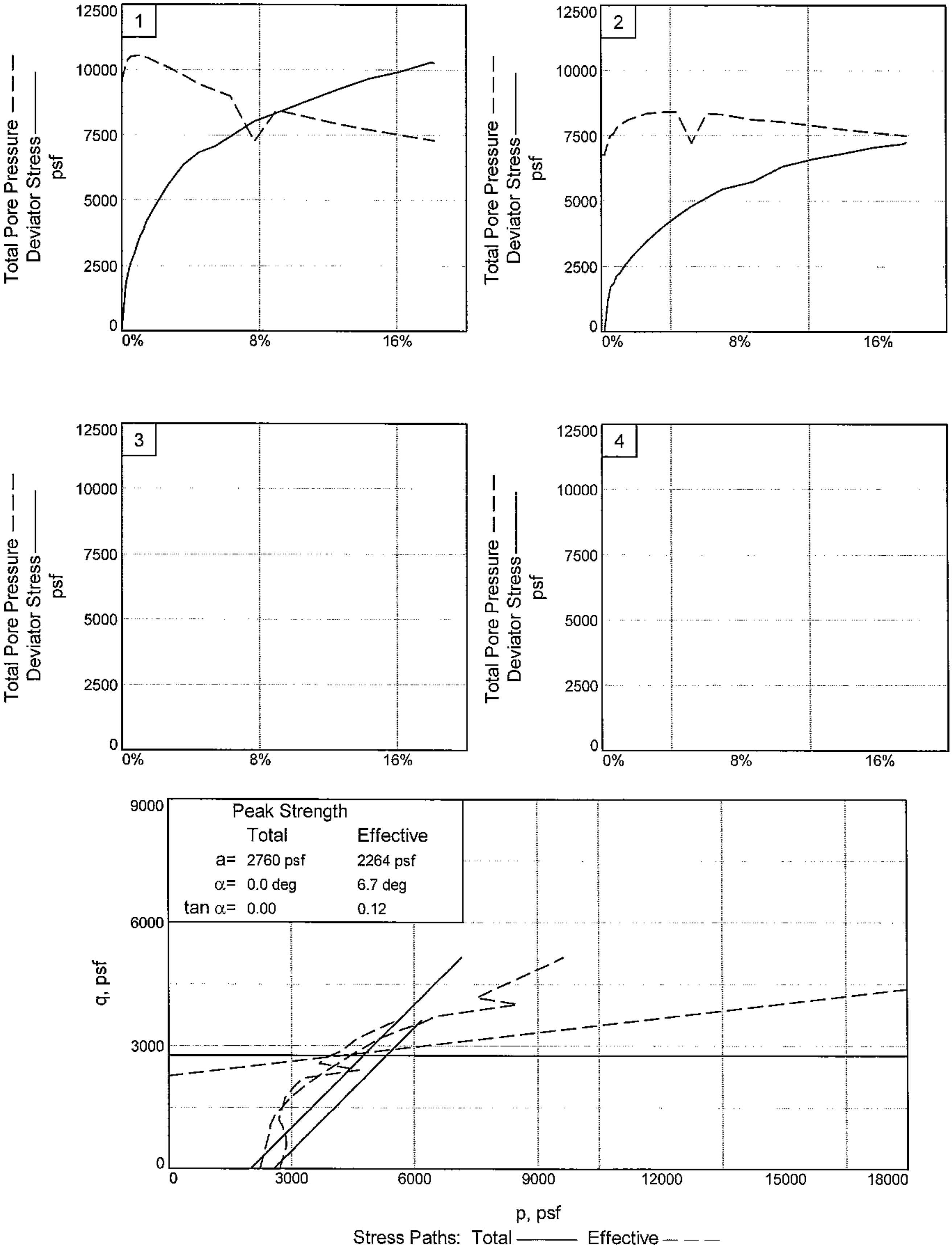
Project: LG&E Cane Run Station

Location: ATB / E-Pond Complex

Sample Number: B-8C **Depth:** 10.0-12.0 Feet

Proj. No.: 3143-10-1216 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
MACTEC Engineering and Consulting, Inc.
Louisville, Kentucky



Client: LG&E
Project: LG&E Cane Run Station
Location: ATB / E-Pond Complex **Depth:** 10.0-12.0 Feet **Sample Number:** B-8C
Project No.: 3143-10-1216 **Figure** ________

MACTEC Engineering and Consulting, Inc.

DIRECT SHEAR TEST RESULTS

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

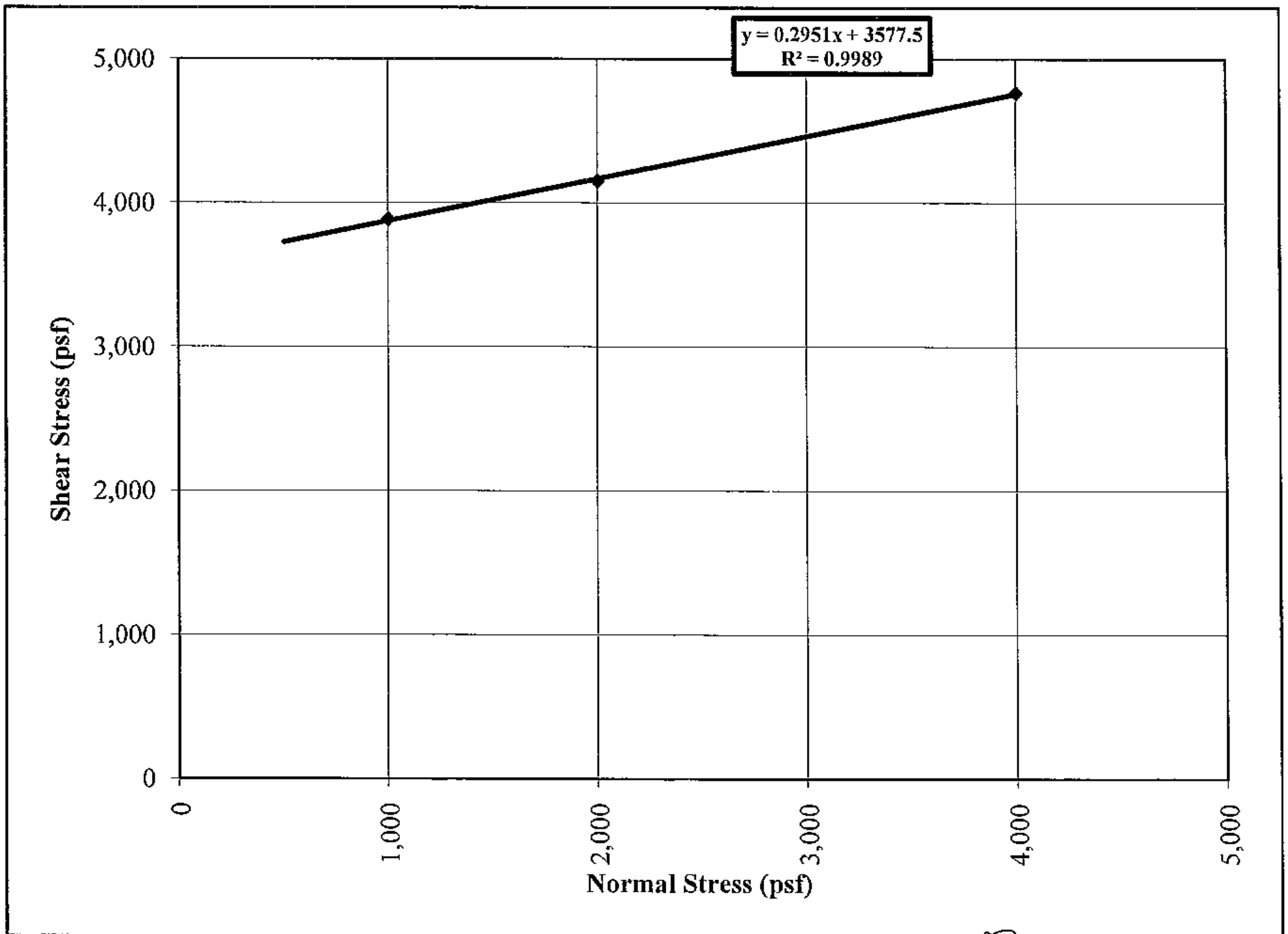
Date Tested: 2/17/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216

Boring: B-1C **Depth:** 10 to 12 feet
Sample Description: Brown and gray, lean CLAY

SUMMARY OF TEST RESULTS

Normal Stress, psf	1000	2001	4001
Shear Stress, psf	3,884	4,151	4,764
Initial Moisture Content, %	17.43%	17.55%	18.03%
Initial Dry Density, pcf	110.4	109.5	109.3
Final Moisture Content, %	20.2%	19.9%	19.7%

Cohesion: **3,578** psf
Angle of Internal Friction: **16** °



Reviewed By: ________

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

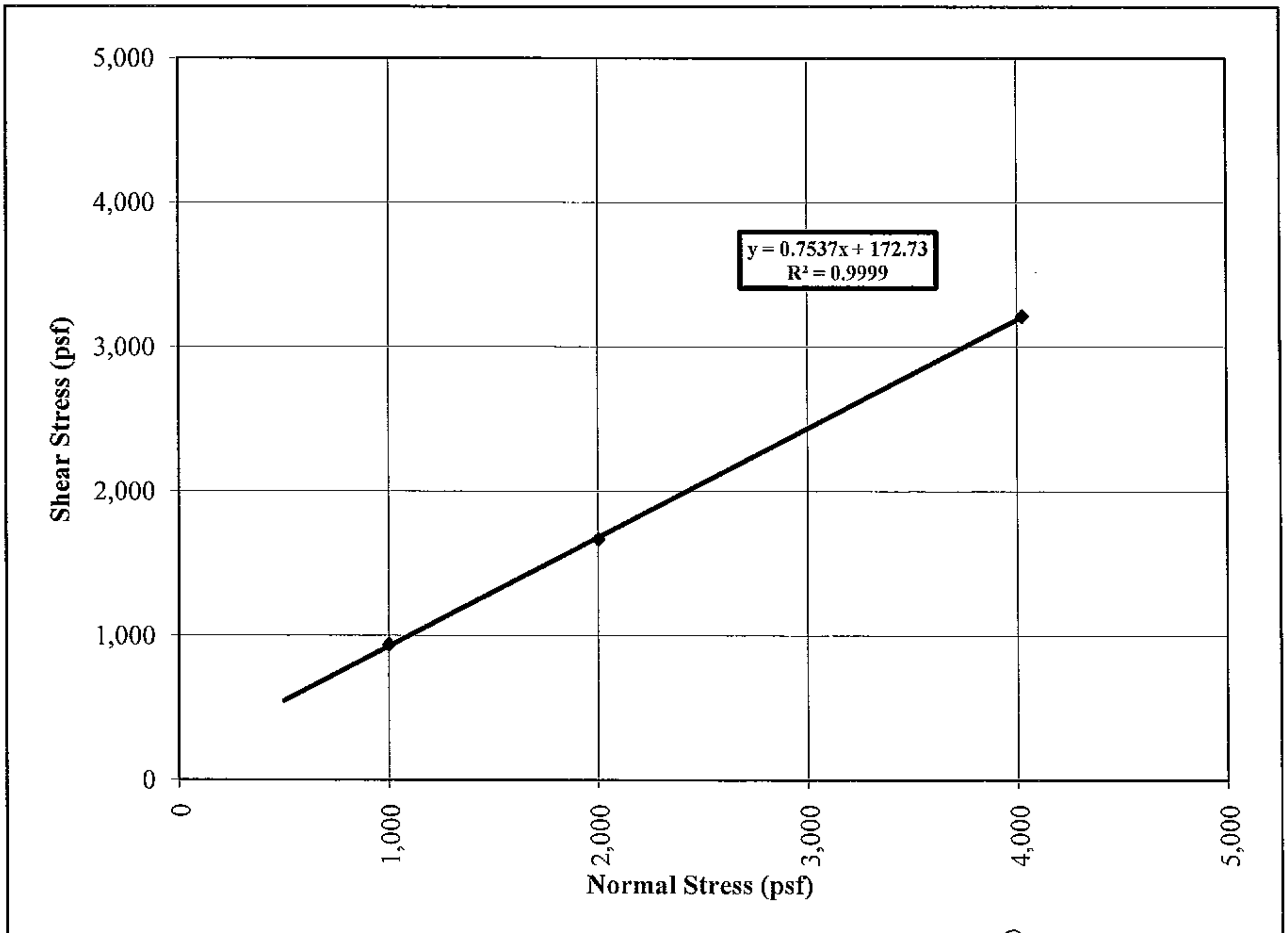
Date Tested: 1/27/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216.02

Boring: B-2C **Depth:** 30 to 32 feet
Sample Description: Brown, poorly graded, fine to medium SAND (Remolded sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	936	1,666	3,212
Initial Moisture Content, %	9.24%	8.72%	7.63%
Initial Dry Density, pcf	94.3	94.9	93.4
Final Moisture Content, %	23.2%	23.7%	23.9%

Cohesion: 173 psf
Angle of Internal Friction: 37 °



Reviewed By: ________

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13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

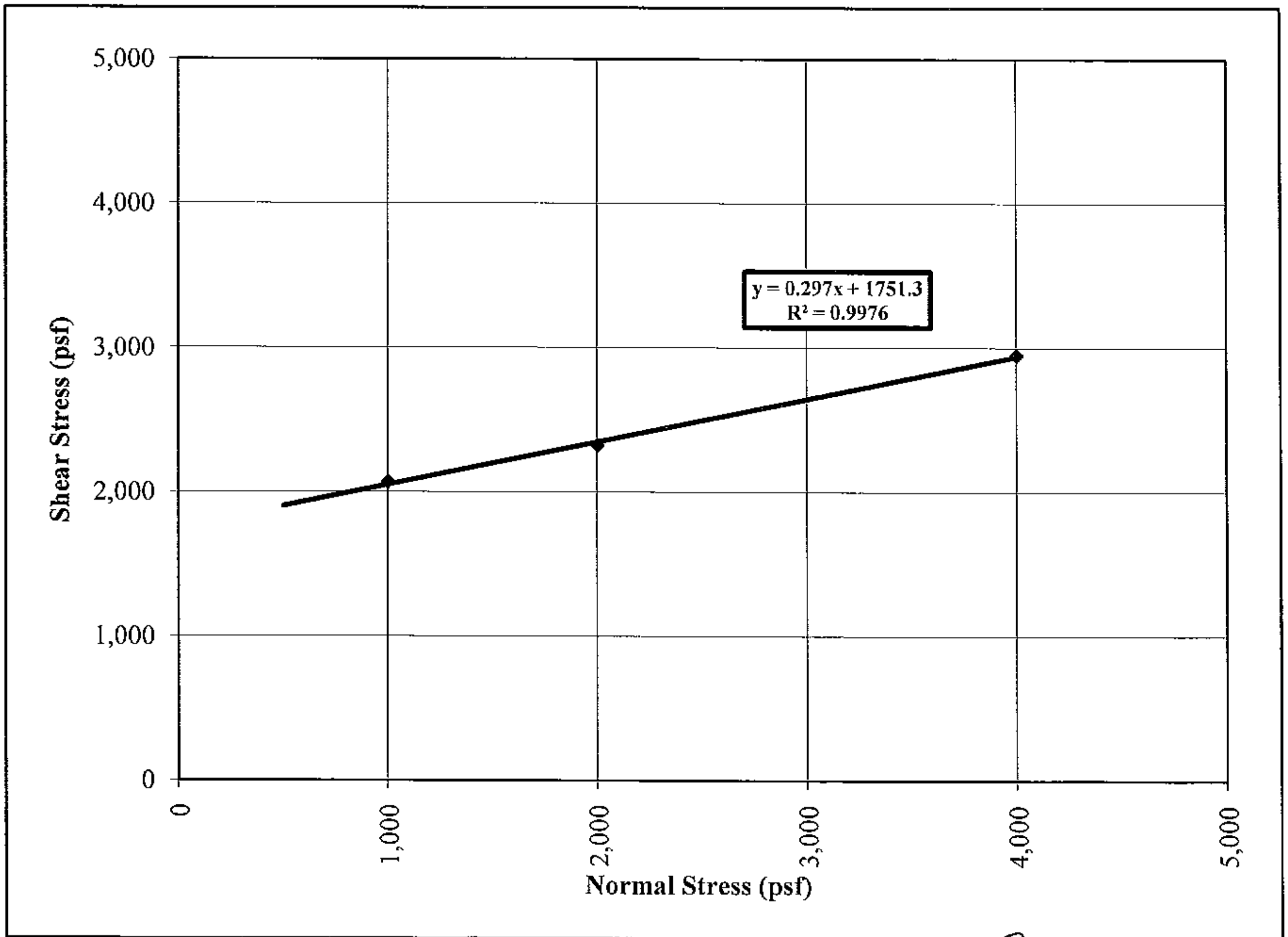
Date Tested: 2/16/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216

Boring: B-3T **Depth:** 5 to 7 feet
Sample Description: Brown, lean CLAY (Remolded Sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	1000	2001	4001
Shear Stress, psf	2,065	2,320	2,948
Initial Moisture Content, %	20.17%	19.66%	19.39%
Initial Dry Density, pcf	101.8	105.3	103.9
Final Moisture Content, %	24.0%	22.0%	21.0%

Cohesion: **1,751 psf**
Angle of Internal Friction: 17 °



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13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

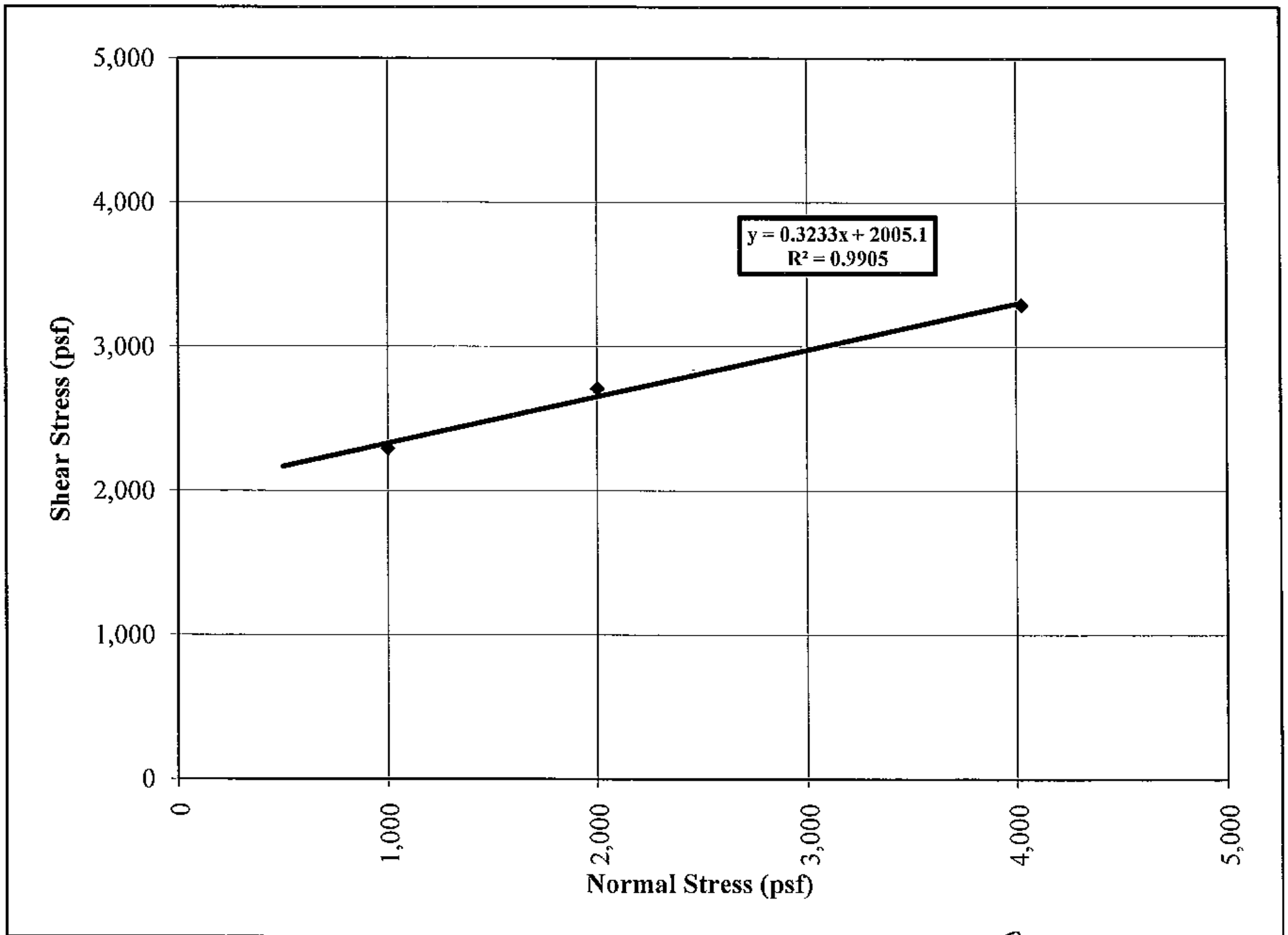
Date Tested: 2/8/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216

Boring: B-5C **Depth:** 15-17 feet
Sample Description: Brown, lean CLAY (Remolded Sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	2,291	2,708	3,289
Initial Moisture Content, %	21.03%	22.88%	22.36%
Initial Dry Density, pcf	100.4	101.0	98.7
Final Moisture Content, %	24.3%	25.7%	26.4%

Cohesion: **2,005 psf**
Angle of Internal Friction: **18 °**



Reviewed By: [signature]

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MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

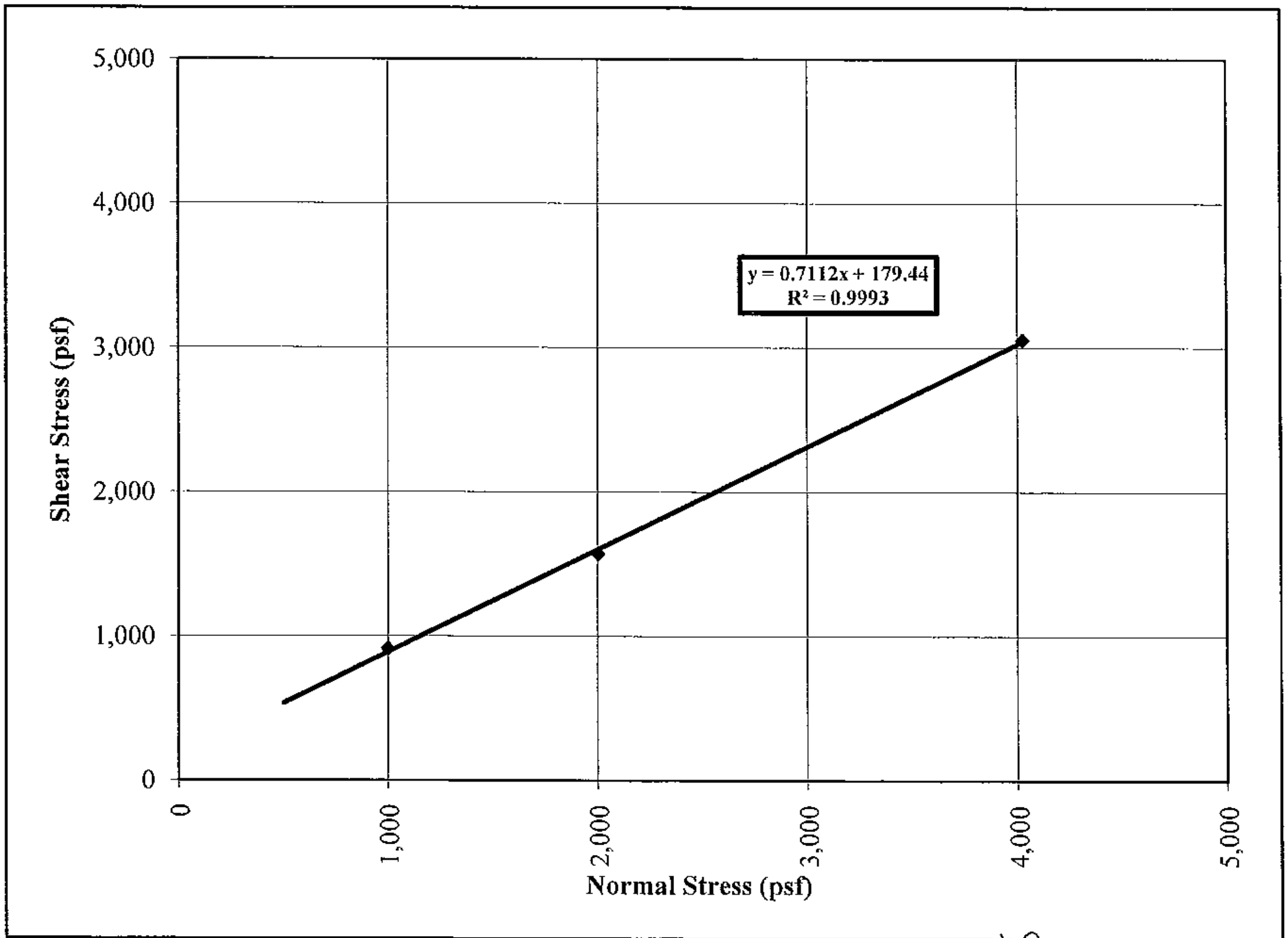
Date Tested: 2/9/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216

Boring: B-5C **Depth:** 45 to 47 feet
Sample Description: Brown, poorly graded, fine to medium grained SAND (remolded sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	912	1,569	3,054
Initial Moisture Content, %	5.23%	5.72%	6.58%
Initial Dry Density, pcf	100.2	95.9	97.3
Final Moisture Content, %	21.7%	21.2%	21.5%

Cohesion: 179 psf
Angle of Internal Friction: 35 °



Reviewed By: ________

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

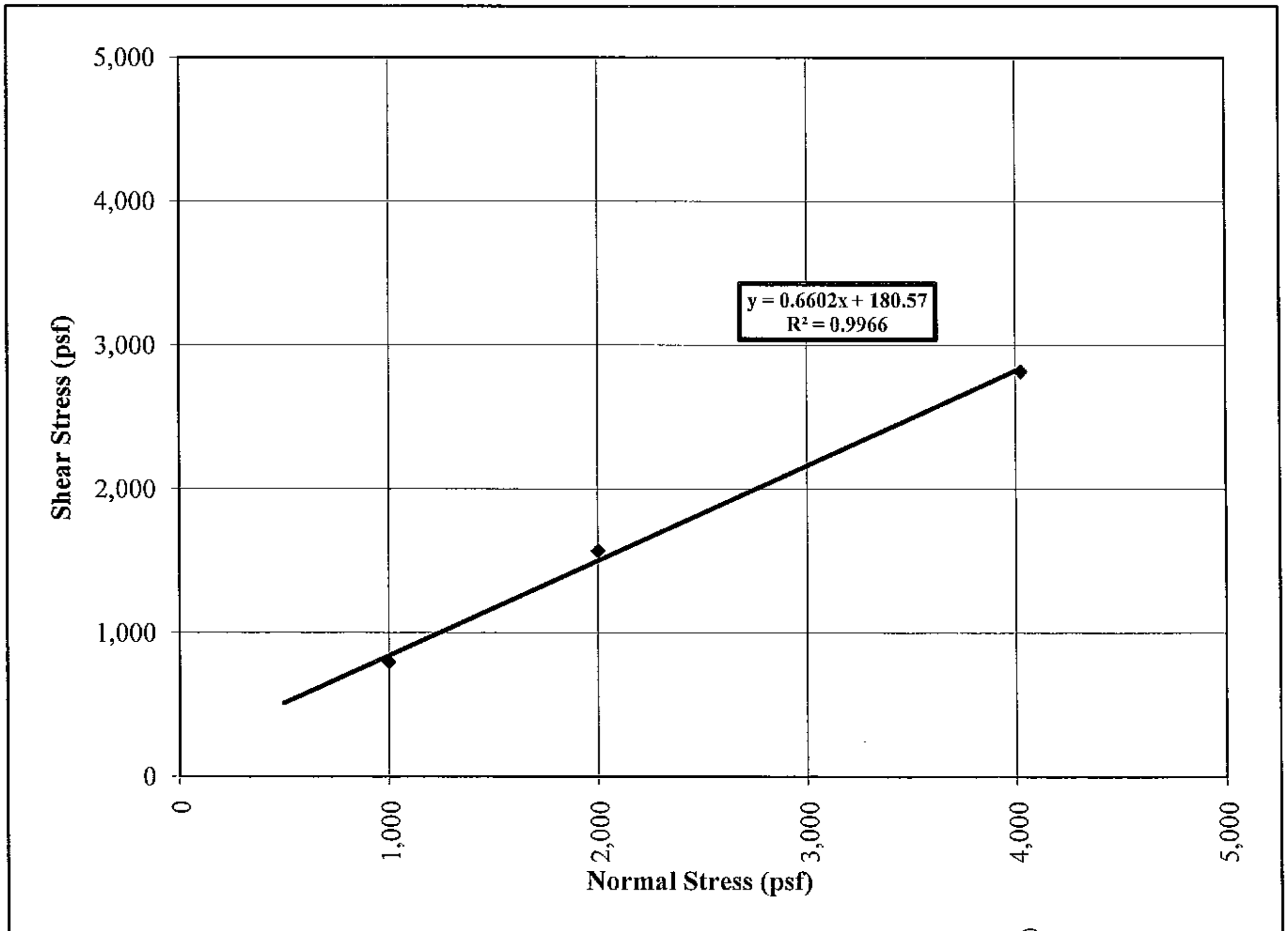
Date Tested: 2/9/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216

Boring: B-6C **Depth:** 25 to 27 feet
Sample Description: Brown, poorly graded, fine to medium grained SAND (Remolded Sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	795	1,569	2,816
Initial Moisture Content, %	11.18%	10.63%	10.82%
Initial Dry Density, pcf	85.9	89.3	87.7
Final Moisture Content, %	27.1%	25.9%	24.8%

Cohesion: 181 psf
Angle of Internal Friction: 33 °



Reviewed By: ________

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

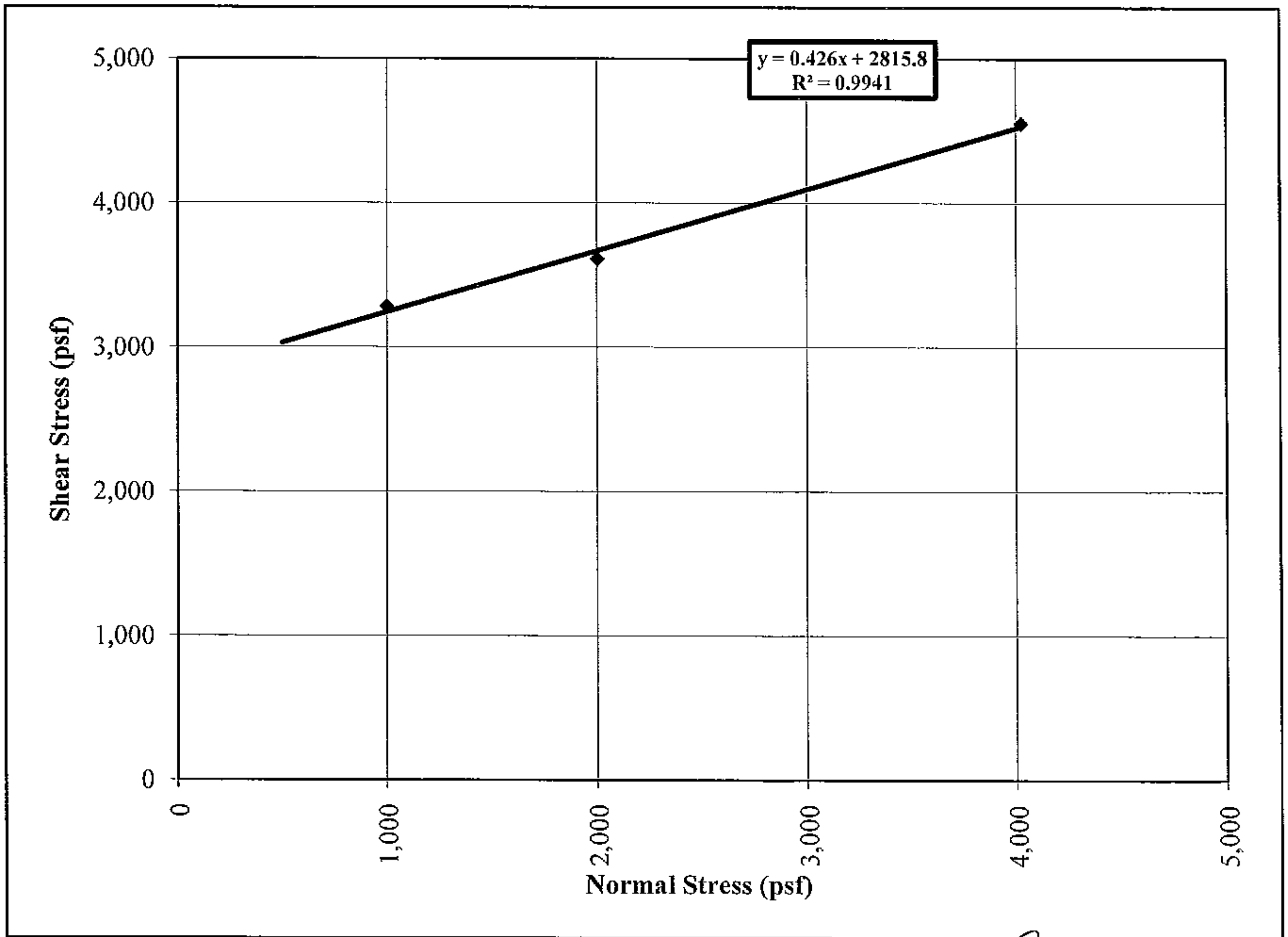
Date Tested: 1/25/10
Project: ATB/ E-Pond
Project No.: 3143-10-1216.02

Boring: B-7C **Depth:** 5 to 7 feet
Sample Description: Brown, lean CLAY

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	3,280	3,611	4,550
Initial Moisture Content, %	17.33%	16.49%	17.04%
Initial Dry Density, pcf	116.6	113.8	110.1
Final Moisture Content, %	22.0%	19.7%	18.8%

Cohesion: **2,816** psf
Angle of Internal Friction: **23** °



Reviewed By:

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

Date Tested: 2/2/10 **Lab No.:** ________

Project: ATB/ E-Pond

Project No.: 3143-10-1216

Boring: B-7C **Depth:** 15 to 17 feet

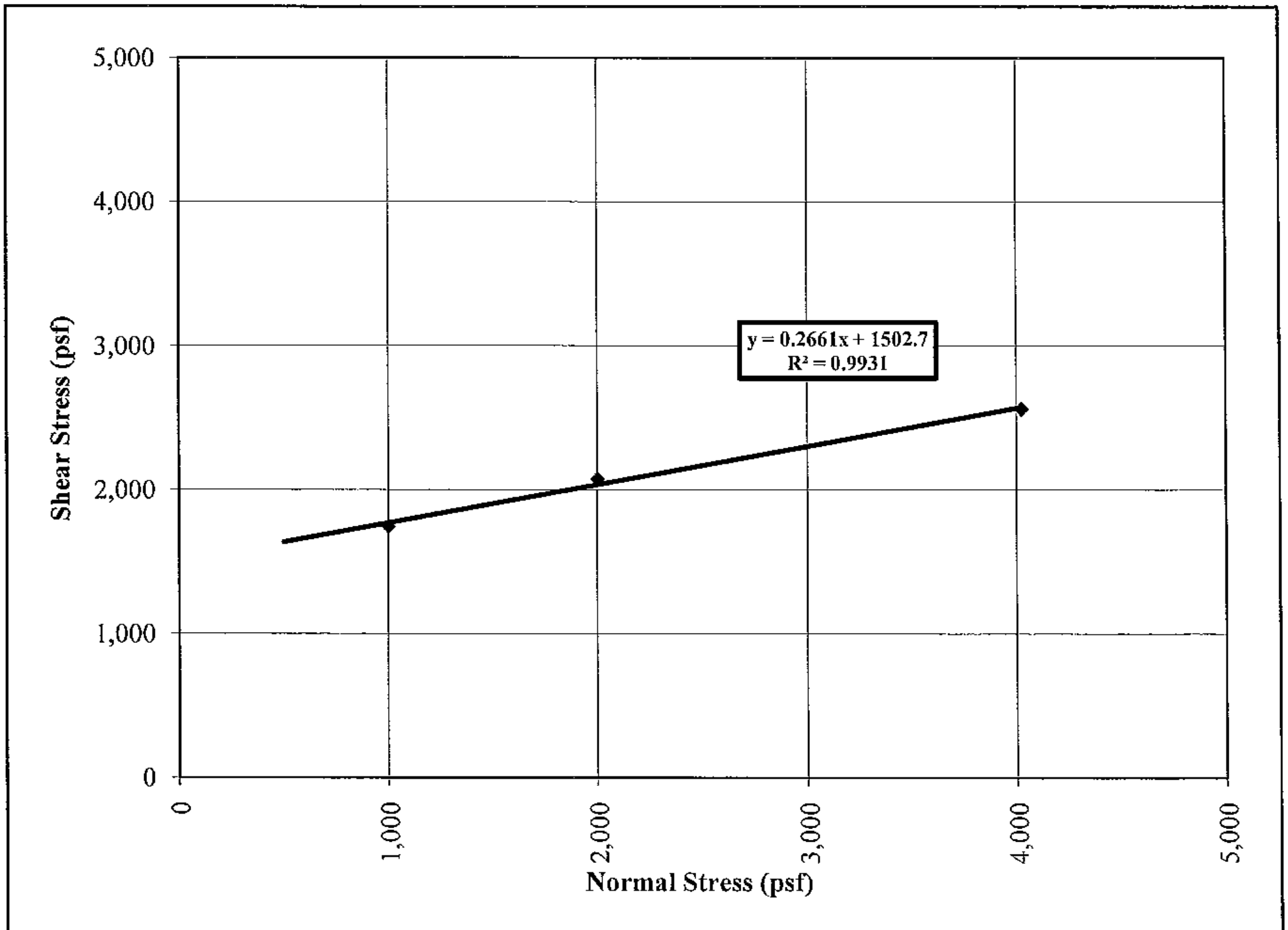
Sample Description: Brown and gray, silty, lean CLAY

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	1,743	2,074	2,561
Initial Moisture Content, %	22.1%	23.3%	22.5%
Initial Dry Density, pcf	102.3	96.6	98.2
Final Moisture Content, %	25.1%	26.0%	24.1%

Cohesion: 1,503 psf

Angle of Internal Friction: 15 °



Reviewed By: ________

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

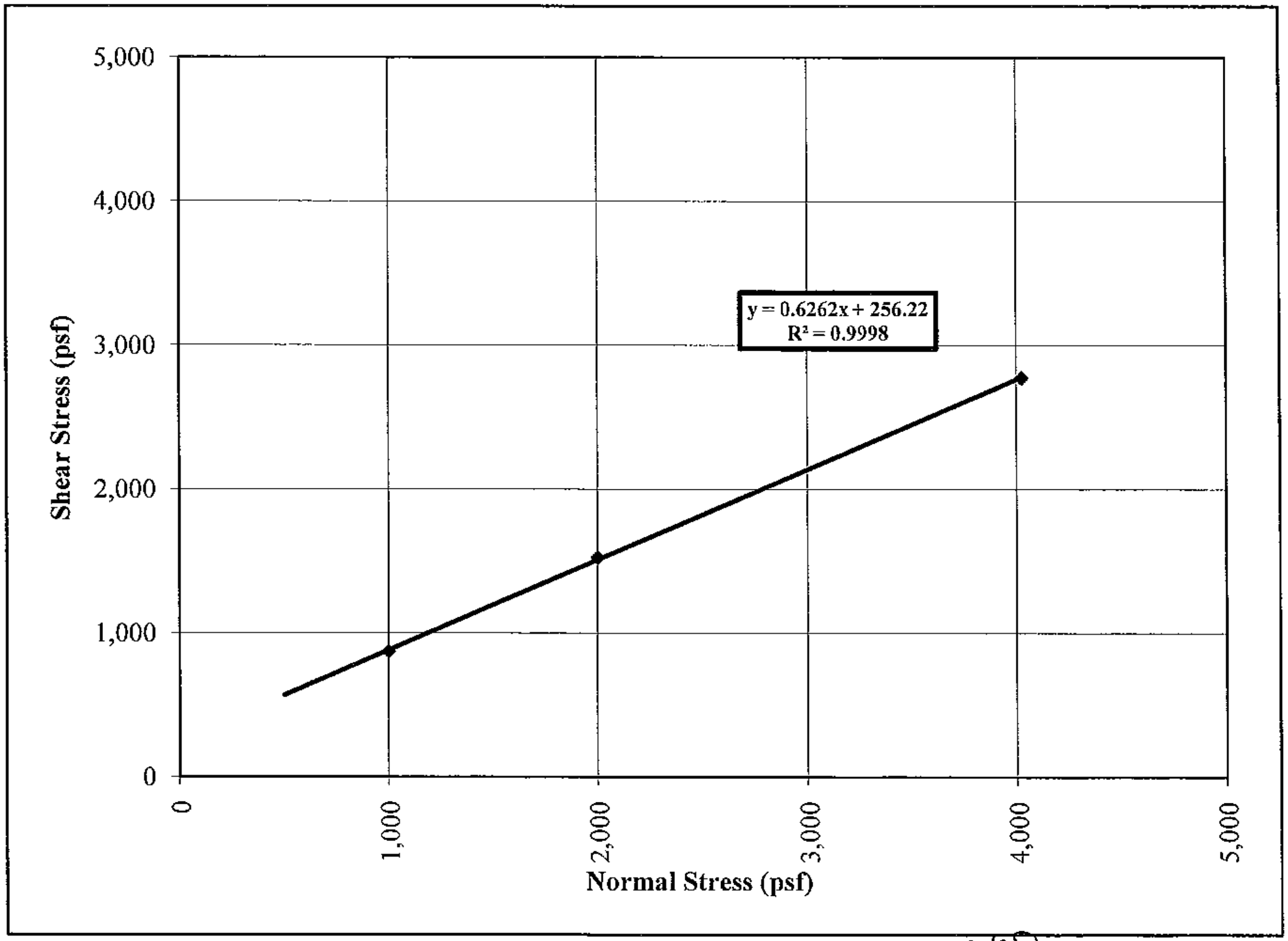
Date Tested: 2/2/10 **Lab No.:** ________
Project: ATB/ E -Pond
Project No.: 3143-10-1216

Boring: B-7C **Depth:** 25 to 27 feet
Sample Description: Brown, poorly graded, fine to medium grained SAND (remolded sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	871	1,525	2,772
Initial Moisture Content, %	6.6%	8.3%	7.2%
Initial Dry Density, pcf	92.6	91.0	92.1
Final Moisture Content, %	23.1%	24.2%	23.7%

Cohesion: 256 psf
Angle of Internal Friction: 32 °



Reviewed By: ________

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

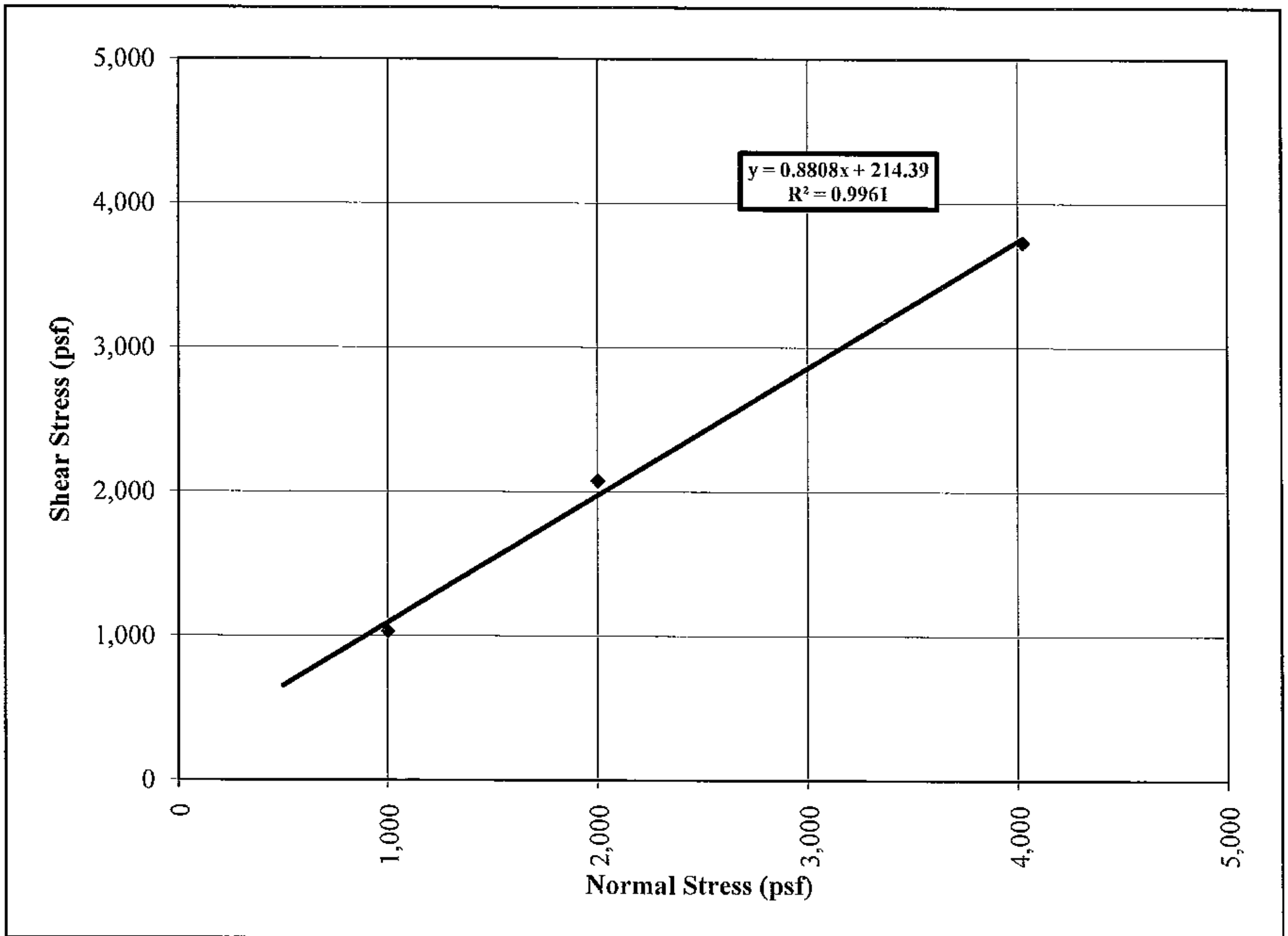
Date Tested: 1/29/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-09-1216

Boring: B-7C **Depth:** 35 to 37 feet
Sample Description: Brown, poorly graded, fine to medium grained SAND (remolded sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	1,030	2,074	3,729
Initial Moisture Content, %	6.87%	6.65%	6.87%
Initial Dry Density, pcf	111.8	110.9	112.0
Final Moisture Content, %	22.7%	23.0%	22.6%

Cohesion: **214** **psf**
Angle of Internal Friction: **41** °



Reviewed By: ________

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

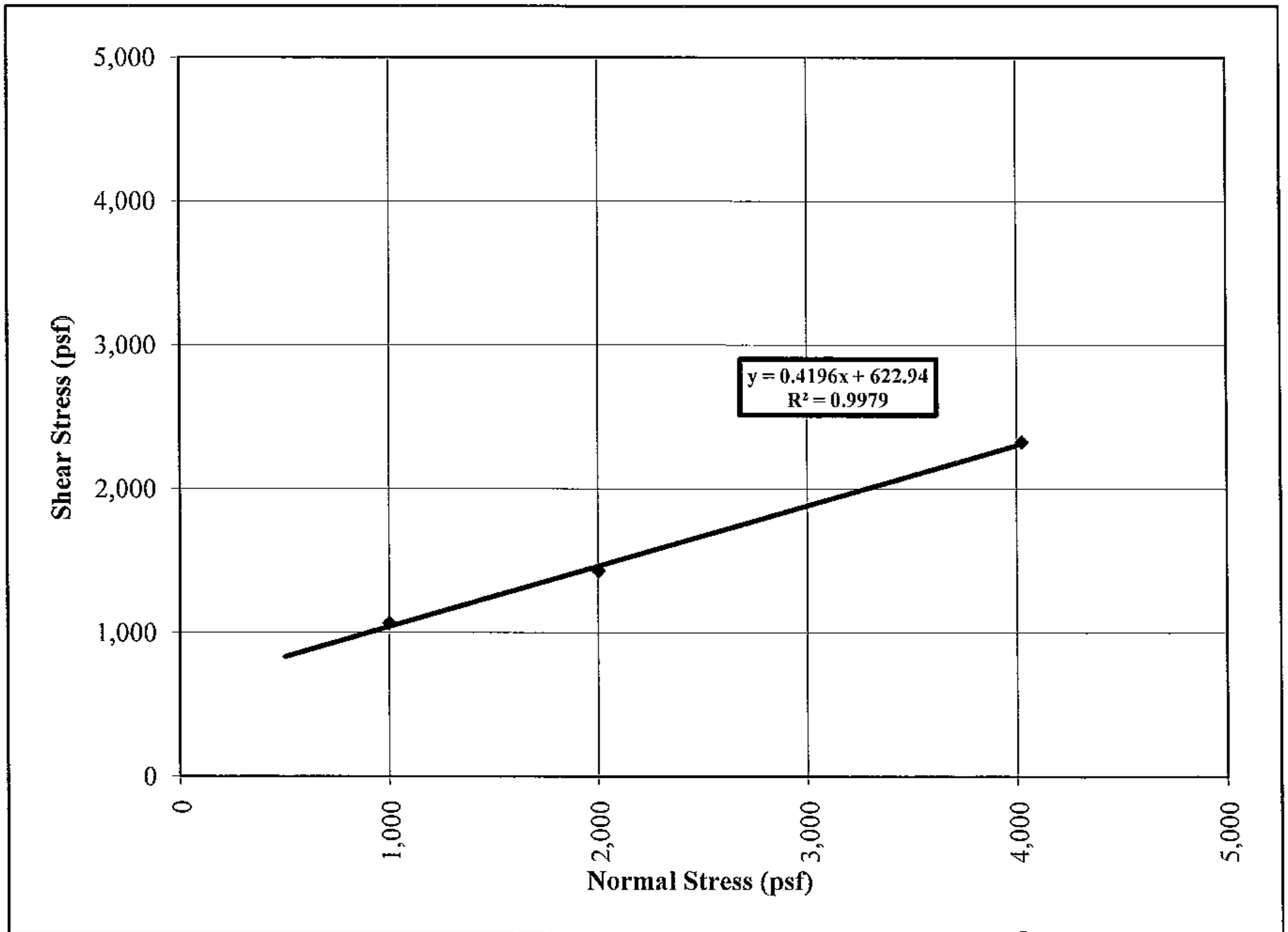
Date Tested: 2/3/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216

Boring: B-8T **Depth:** 5 to 7 feet
Sample Description: Brown and Gray, lean CLAY

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	1,065	1,429	2,323
Initial Moisture Content, %	26.45%	27.95%	25.26%
Initial Dry Density, pcf	99.1	96.7	98.0
Final Moisture Content, %	28.4%	29.9%	25.1%

Cohesion: **623** psf
Angle of Internal Friction: **23** °



Reviewed By: [signature]

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

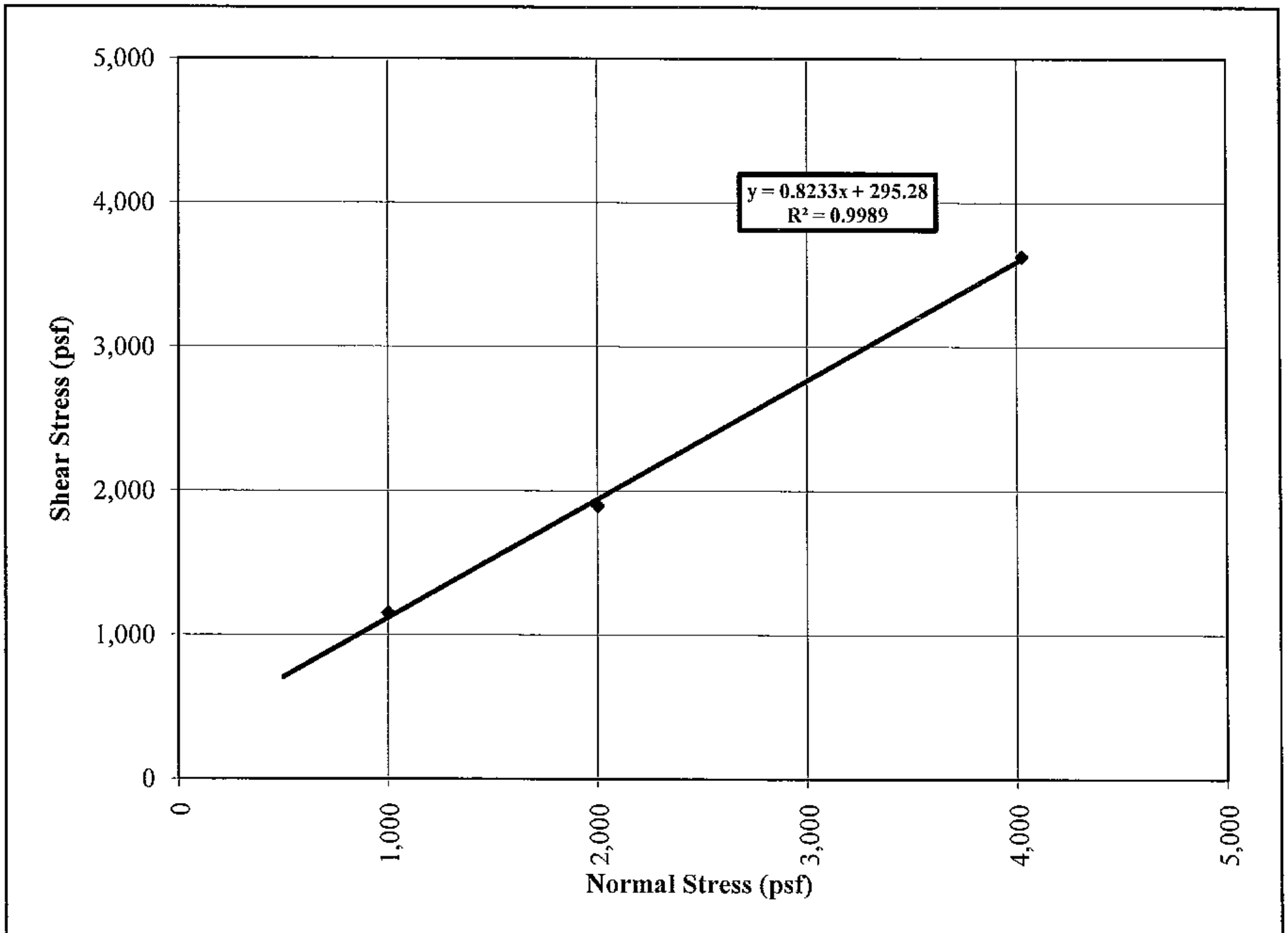
Date Tested: 2/3/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216

Boring: B-8T **Depth:** 20-22 feet
Sample Description: Brown, poorly graded, fine to medium grained SAND (remolded sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	1,150	1,895	3,626
Initial Moisture Content, %	9.92%	9.61%	13.03%
Initial Dry Density, pcf	121.0	121.7	119.7
Final Moisture Content, %	19.0%	20.4%	19.6%

Cohesion: 295 psf
Angle of Internal Friction: 39 °



Reviewed By: ________

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

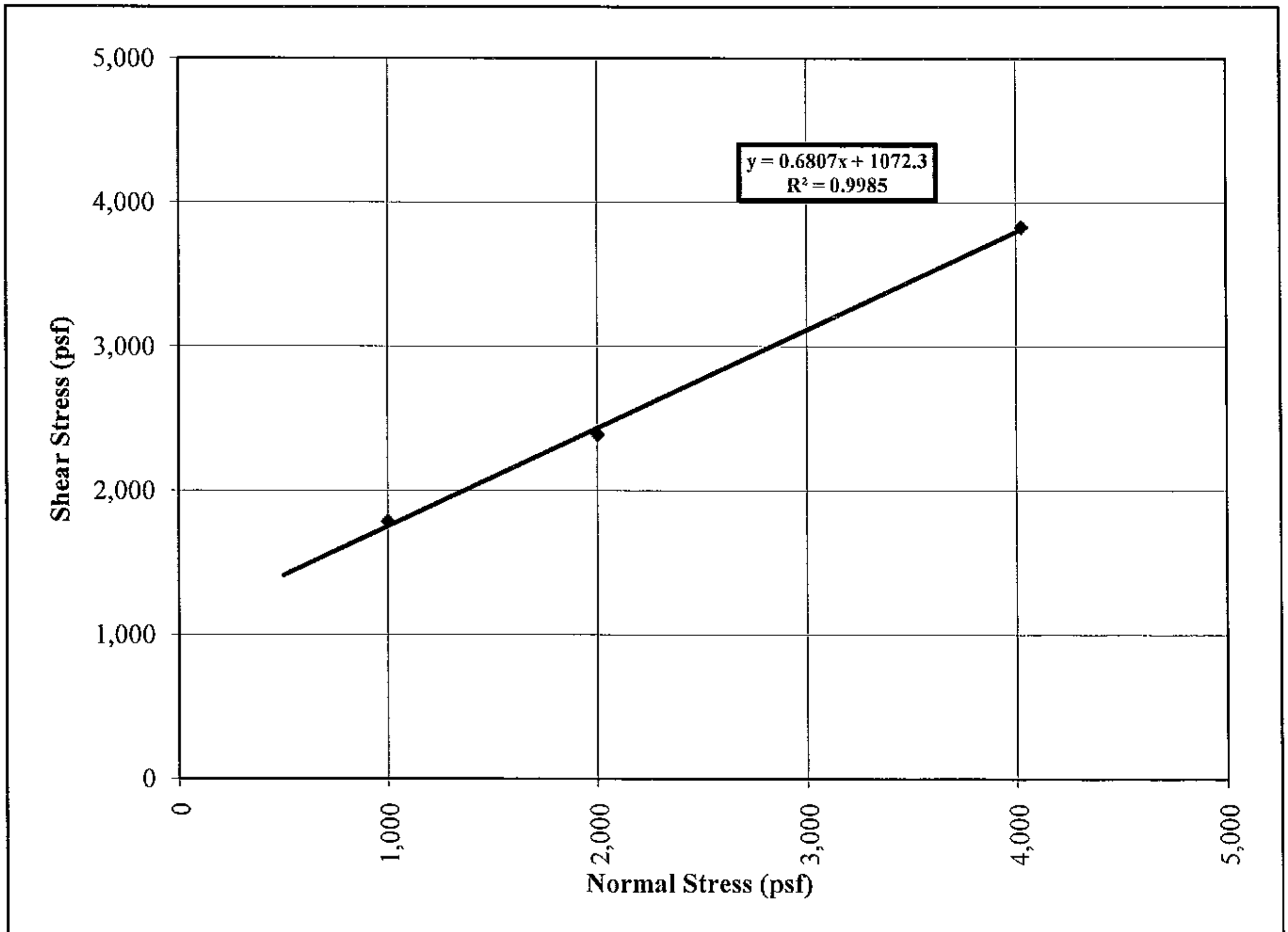
Date Tested: 2/3/10 **Lab No.:** ________
Project: ATB/ E-Pond
Project No.: 3143-10-1216

Boring: B-8S **Depth:** 15 to 17 feet
Sample Description: Brown, sandy CLAY with gravel

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	1,784	2,388	3,828
Initial Moisture Content, %	17.62%	18.07%	18.46%
Initial Dry Density, pcf	114.1	114.6	111.5
Final Moisture Content, %	21.3%	20.1%	19.3%

Cohesion: 1,072 psf
Angle of Internal Friction: 34 °



Reviewed By: [signature]

SUMMARY OF SLOPE STABILITY RESULTS

PCSTABL PLOTS

MACTEC

Project: Cane Run Station
Project No.: 3143-10-1216
Prepared By: ALB Date: 2/22/2010
Checked By: CRV Date: 2/22/2010

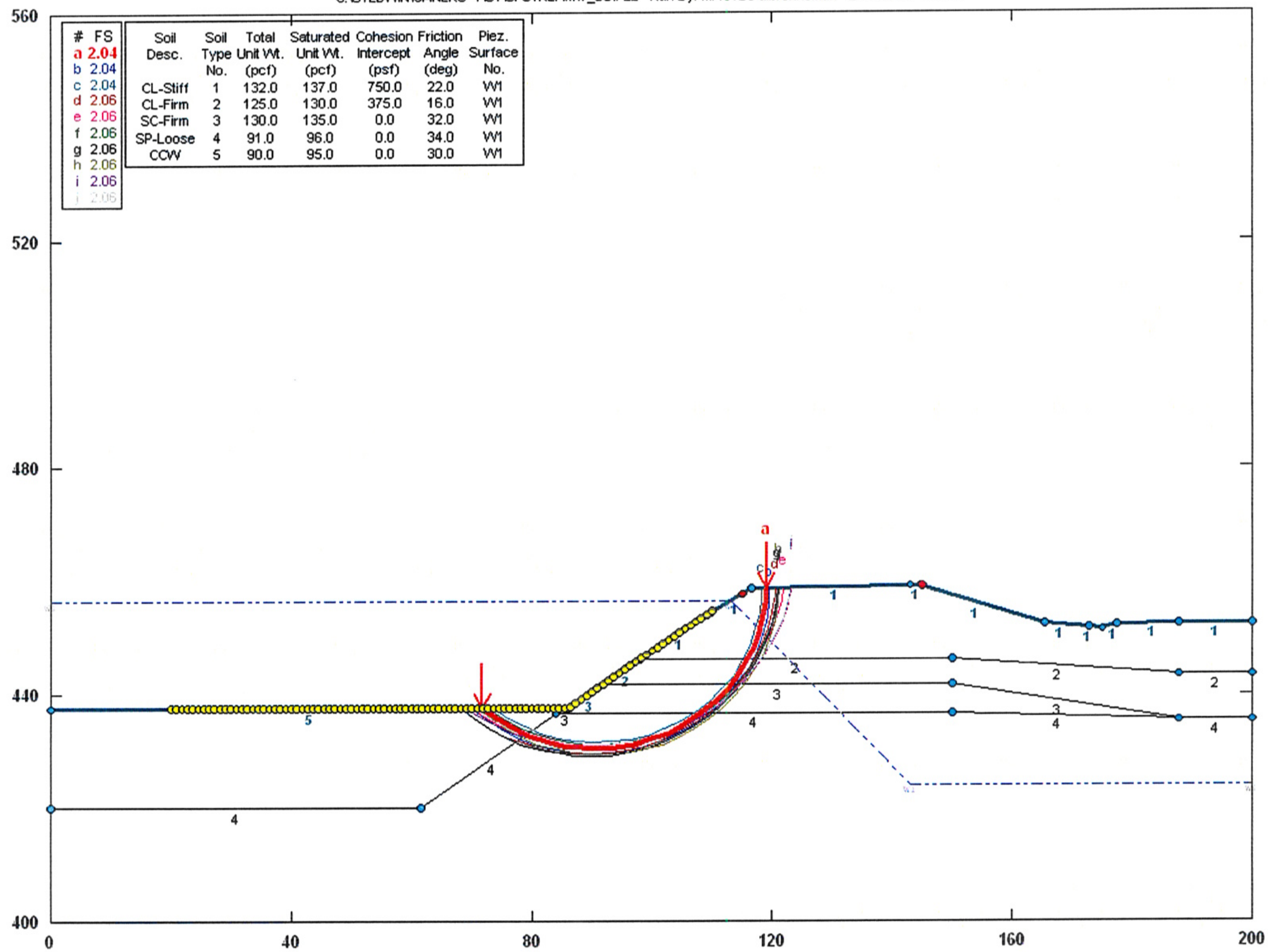
Results of Slope Stability Analyses - ATB / E-Pond Complex

Critical Section	Upstream Slope (H:V)	Downstream Slope (H:V)	Long-Term Steady State (Pool Elevation 456.5')		Maximum Surcharge Pool (Crest Elevation)		Rapid Drawdown		Seismic	
			Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS
1 Upstream	1.4 : 1.0	-	1.5	2.0	1.4	2.1	1.2	1.3	1.0	1.7
1 Downstream	-	3.1 : 1.0	1.5	6.0	1.4	6.0	1.2	6.0	1.0	5.0
2 Upstream	1.5 : 1.0	-	1.5	2.3	1.4		1.2	1.9	1.0	1.9
2 Downstream	-	2.4 : 1.0	1.5	4.5	1.4		1.2	4.5	1.0	3.9
3 Upstream	1.9 : 1.0	-	1.5	5.3	1.4		1.2	3.9	1.0	2.6
3 Downstream	-	2.7 : 1.0	1.5	3.0	1.4		1.2	3.0	1.0	2.6
3.5 Upstream	1.6 : 1.0	-	1.5	4.3	1.4		1.2	4.4	1.0	2.8
3.5 Downstream	-	5.3 : 1.0	1.5	5.0	1.4		1.2	5.0	1.0	3.9
4 Upstream	1.3 : 1.0	-	1.5	2.4	1.4	2.6	1.2	1.5	1.0	2.1
4 Downstream	-	2.9 : 1.0	1.5	4.6	1.4	4.6	1.2	4.6	1.0	3.9
5 Upstream	1.8 : 1.0	-	1.5	3.5	1.4		1.2	3.0	1.0	2.6
5 Downstream	-	2.9 : 1.0	1.5	4.6	1.4		1.2	3.9	1.0	4.6
6 Upstream	1.7 : 1.0	-	1.5	4.8	1.4		1.2	4.1	1.0	3.1
6 Downstream	-	3.2 : 1.0	1.5	4.6	1.4		1.2	4.6	1.0	3.9
7 Downstream	-	2.9 : 1.0	1.5	3.8	1.4		1.2	3.8	1.0	3.2

* Target Factor of Safety References: Design Criteria for Dams & Associated Structures (401 KAR 4:030, KAR 4:040)
USACE EM 1110-2-1902: Slope Stability

Cane Run Station: Section 1, Upstream, Steady-State

C:\STEDWIN\CANERU~1\S1\UPSTREAM\1_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 2:53PM



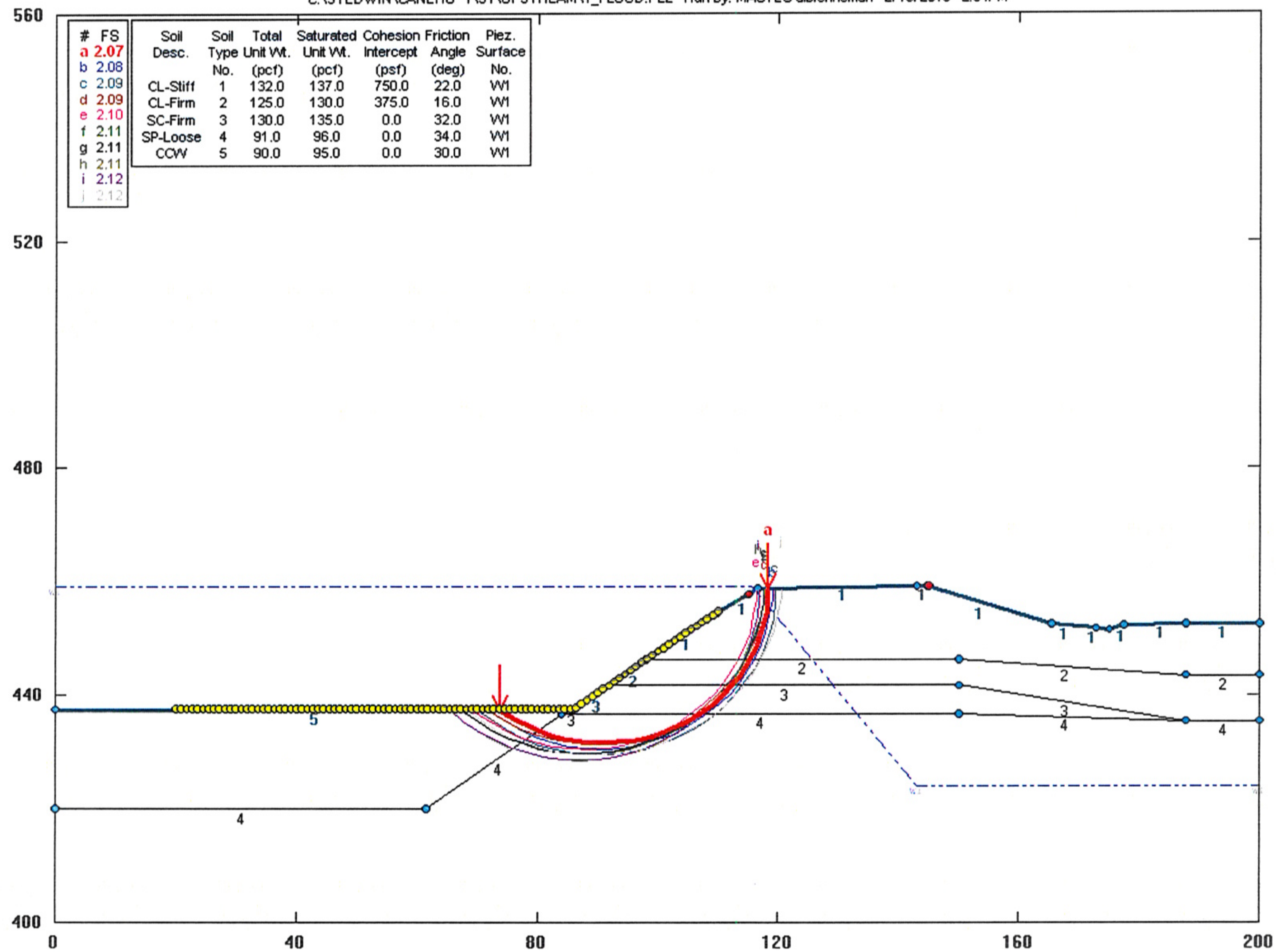
STABL6H FSmin=2.04

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 1, Upstream, Maximum Surcharge Pool

C:\STEDWIN\CANERU~1\S1\UPSTREAM\1_FLOOD.PL2 Run By: MACTEC albrenneman 2/19/2010 2:54PM



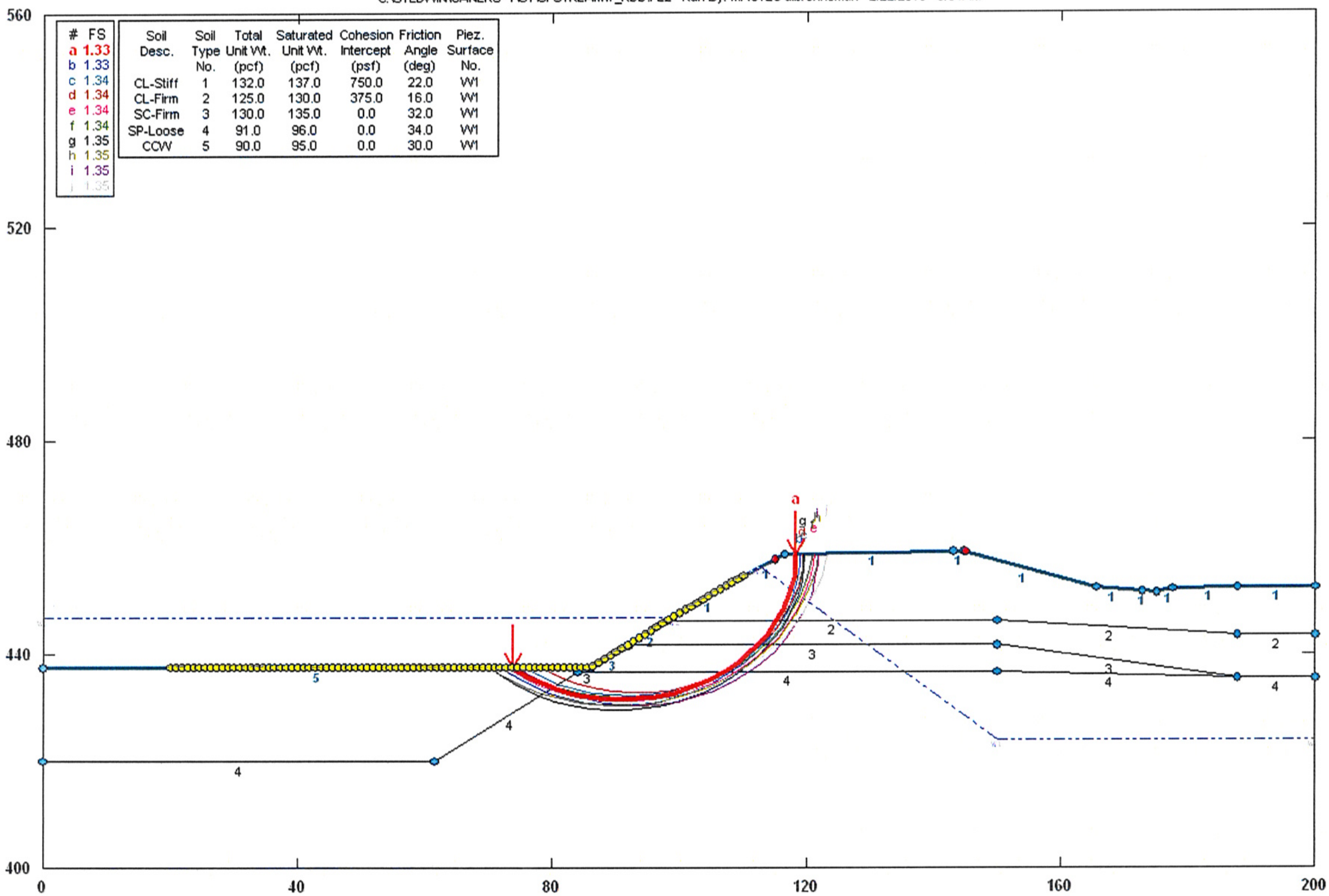
STABL6H FSmin=2.07

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 1, Upstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S1\UPSTREAM\1_RDD.PL2 Run By: MACTEC albrenneman 2/22/2010 9:04AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Firm	2	125.0	130.0	375.0	16.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

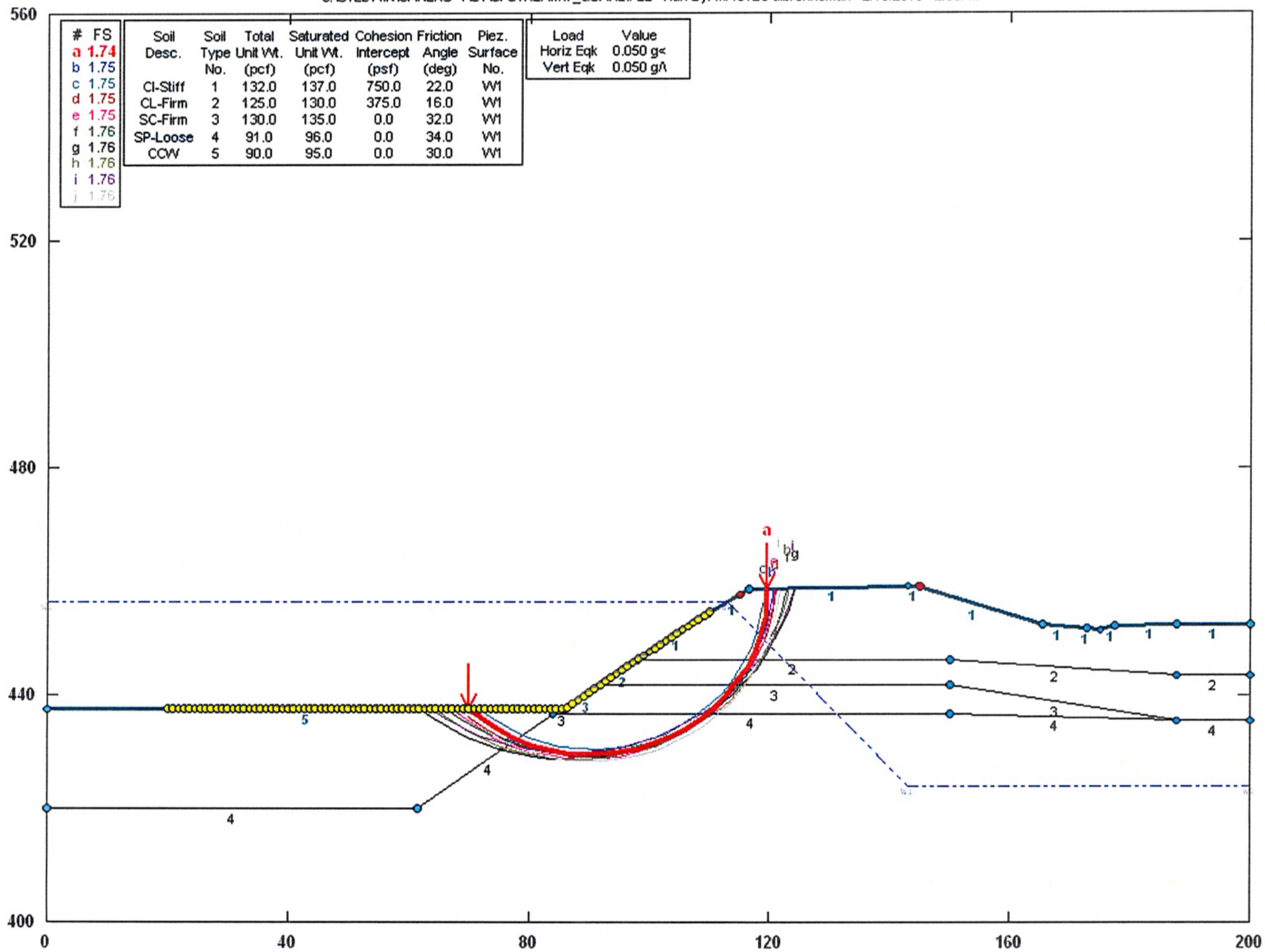
STABL6H FSmin=1.33

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 1, Upstream, Seismic

C:\STEDWIN\CANERU~1\S1\UPSTREAM\1_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 2:56PM



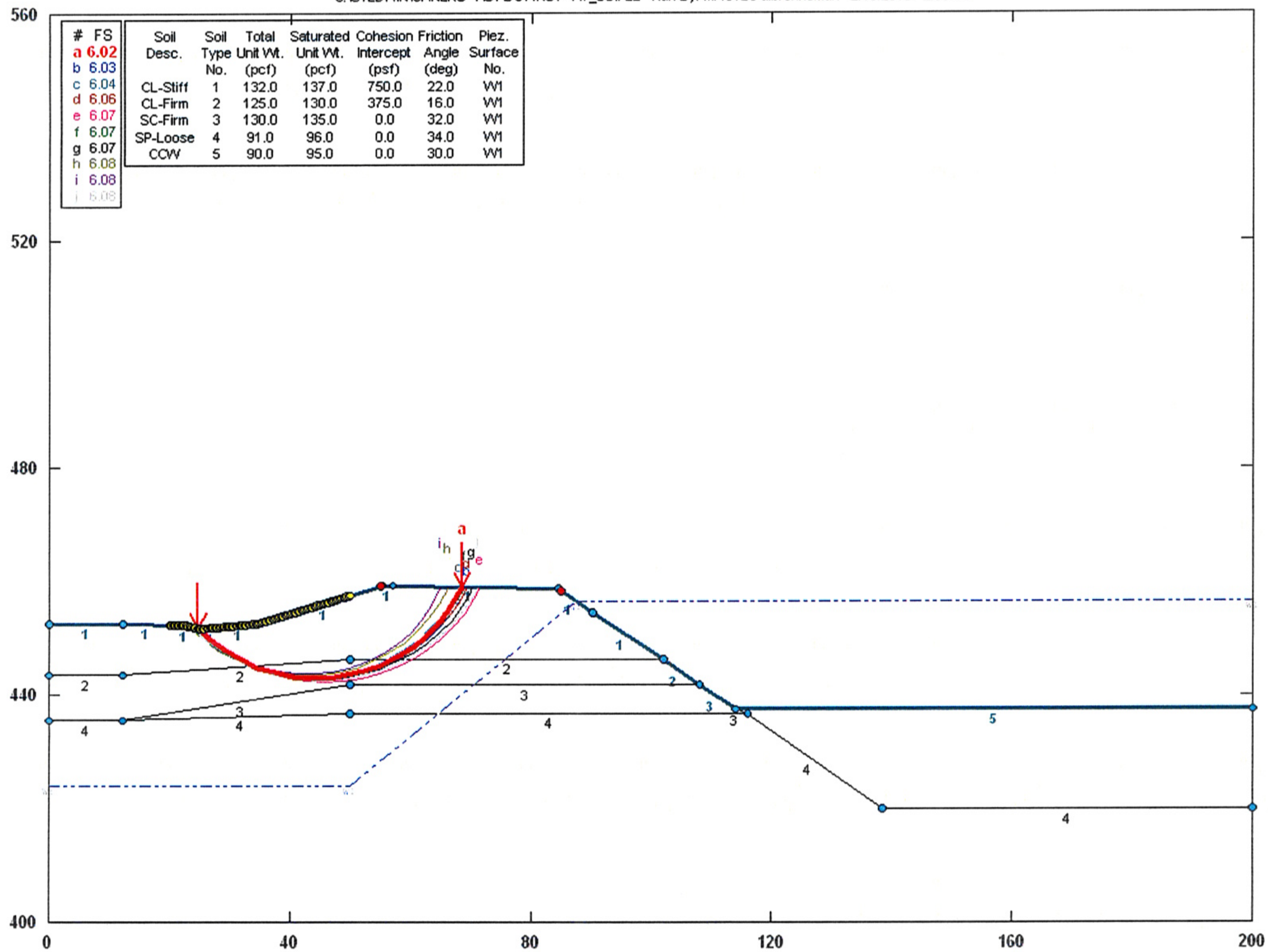
STABL6H FSmin=1.74

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 1, Downstream, Steady-State

C:\STEDWIN\CANERU~1\S1\DOWNST~1\1_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 2:58PM



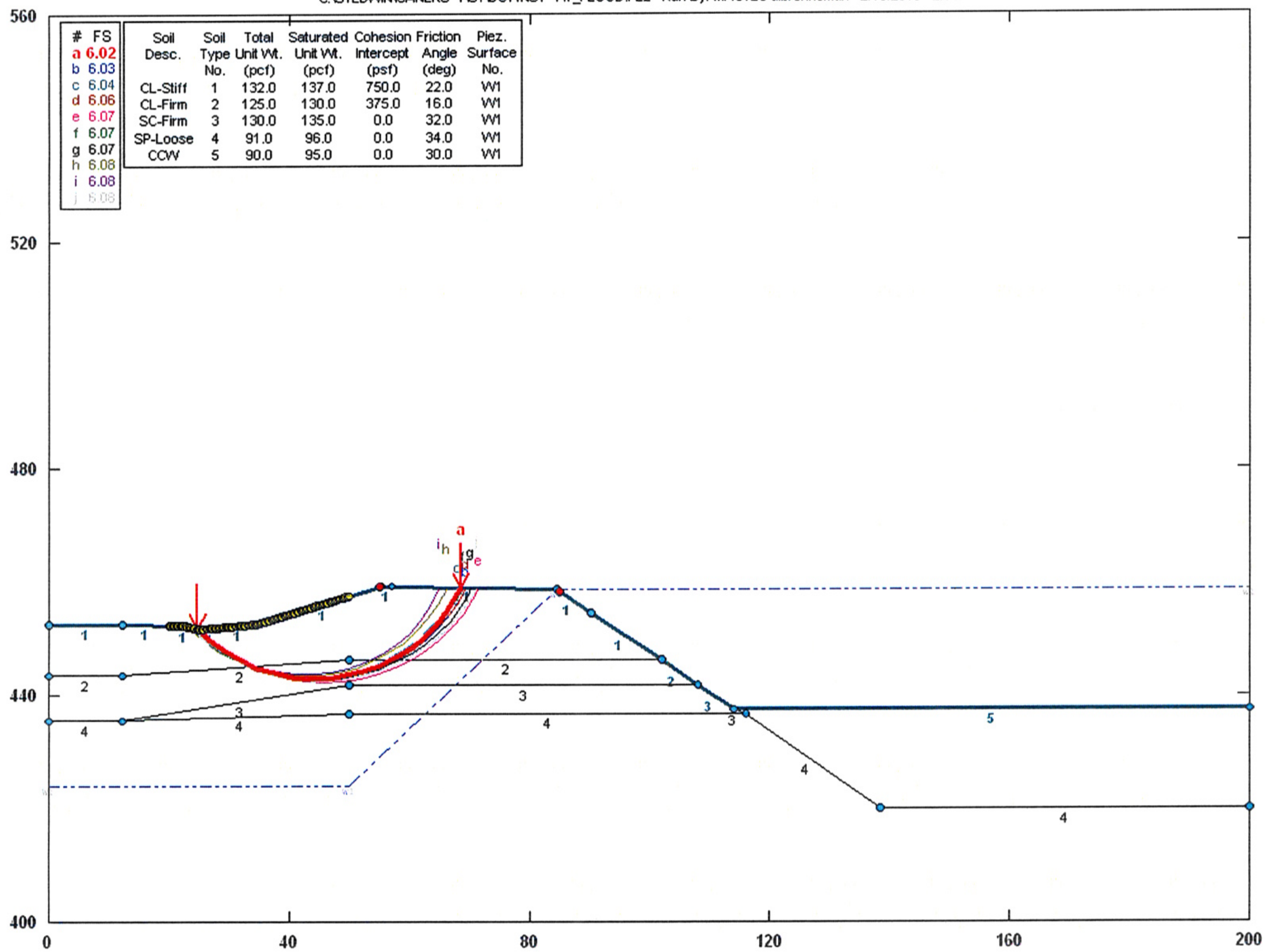
STABL6H FSmin=6.02

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 1, Downstream, Maximum Surcharge Pool

C:\STEDWIN\CANERU~1\S1\DOWNST~1\1_FLOOD.PL2   Run By: MACTEC albrenneman   2/19/2010   2:59PM



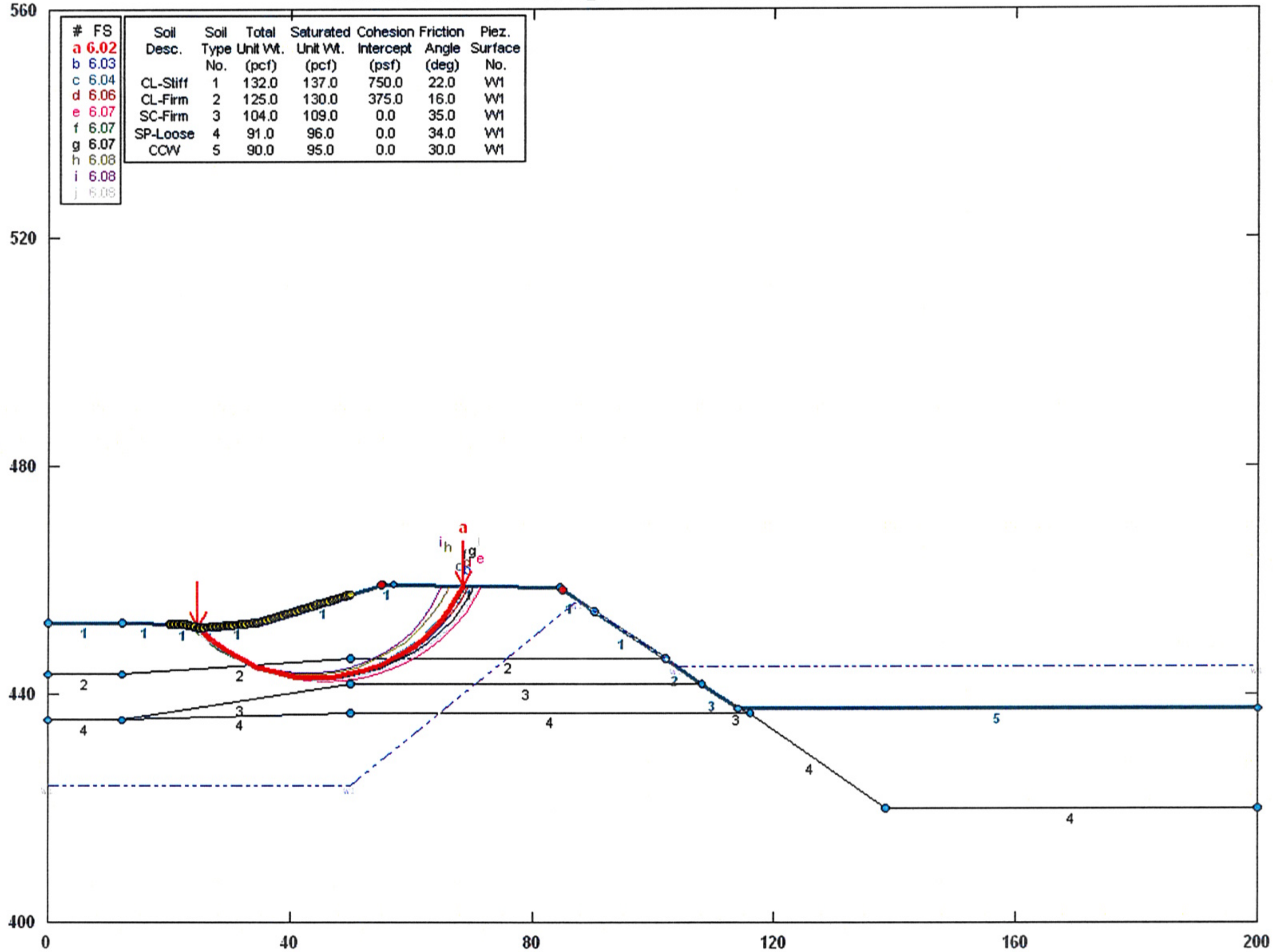
STABL6H FSmin=6.02

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 1, Downstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S1\DOWNST~1\1_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:01PM



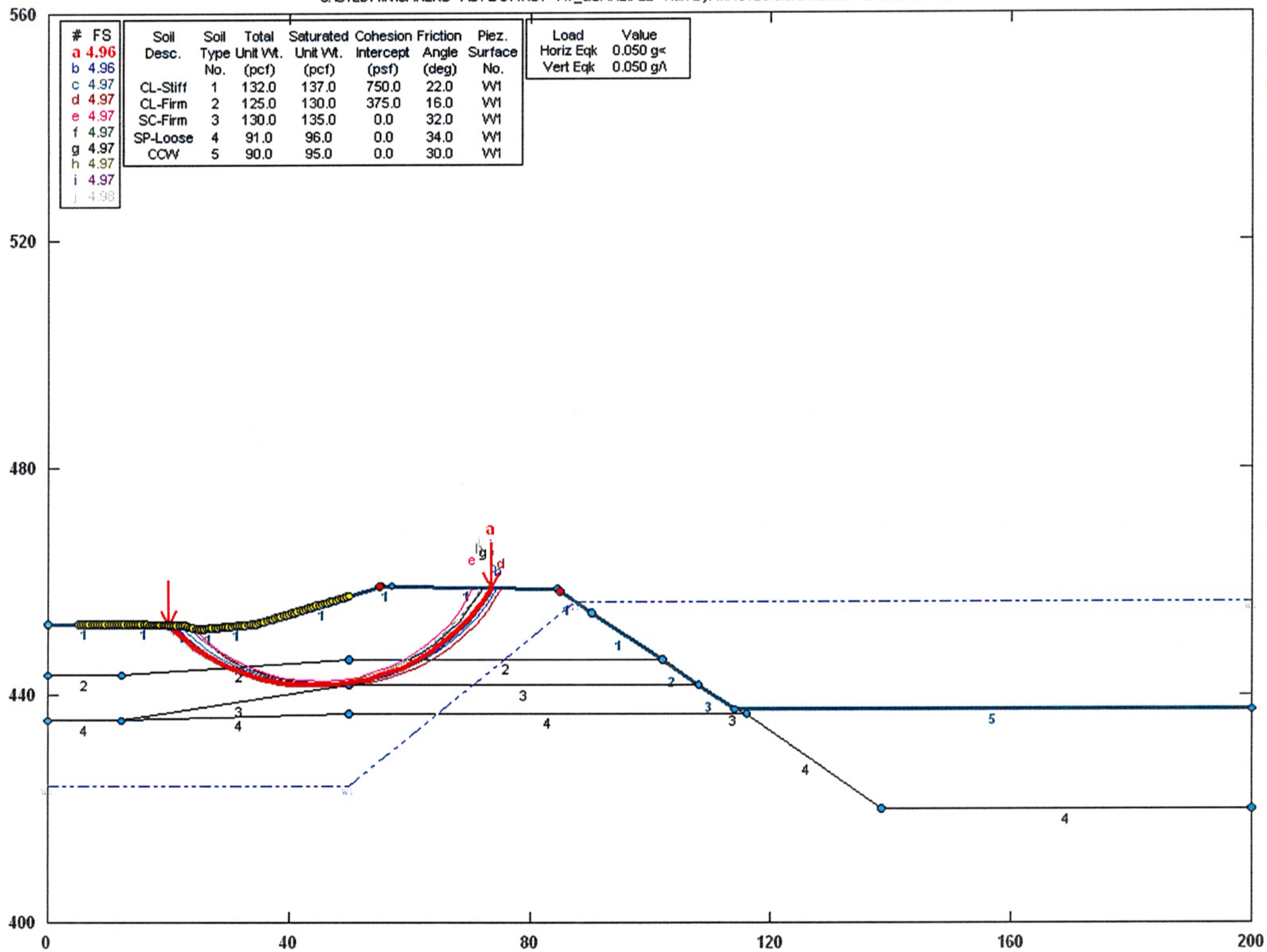
STABL6H FSmin=6.02

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 1, Downstream, Seismic

C:\STEDWIN\CANERU~1\S1\DOWNST~1\1_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 3:02PM



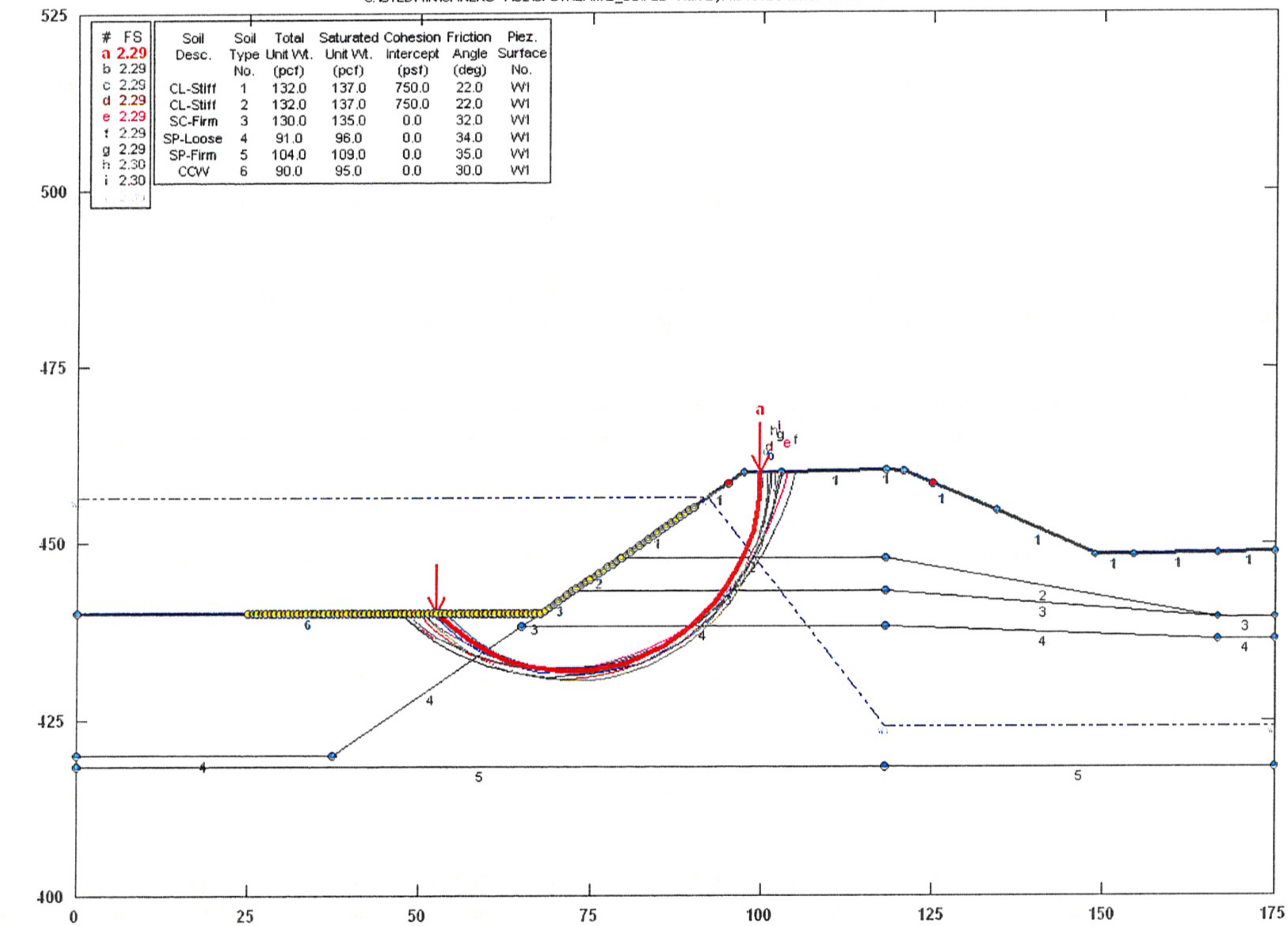
STABL6H FSmin=4.96

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 2, Upstream, Steady-State

C:\STEDWIN\CANERU~1\S2\UPSTREAM\2_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 3:26PM



#	FS
a	2.29
b	2.29
c	2.29
d	2.29
e	2.29
f	2.29
g	2.29
h	2.30
i	2.30

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Stiff	2	132.0	137.0	750.0	22.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
SP-Firm	5	104.0	109.0	0.0	35.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1

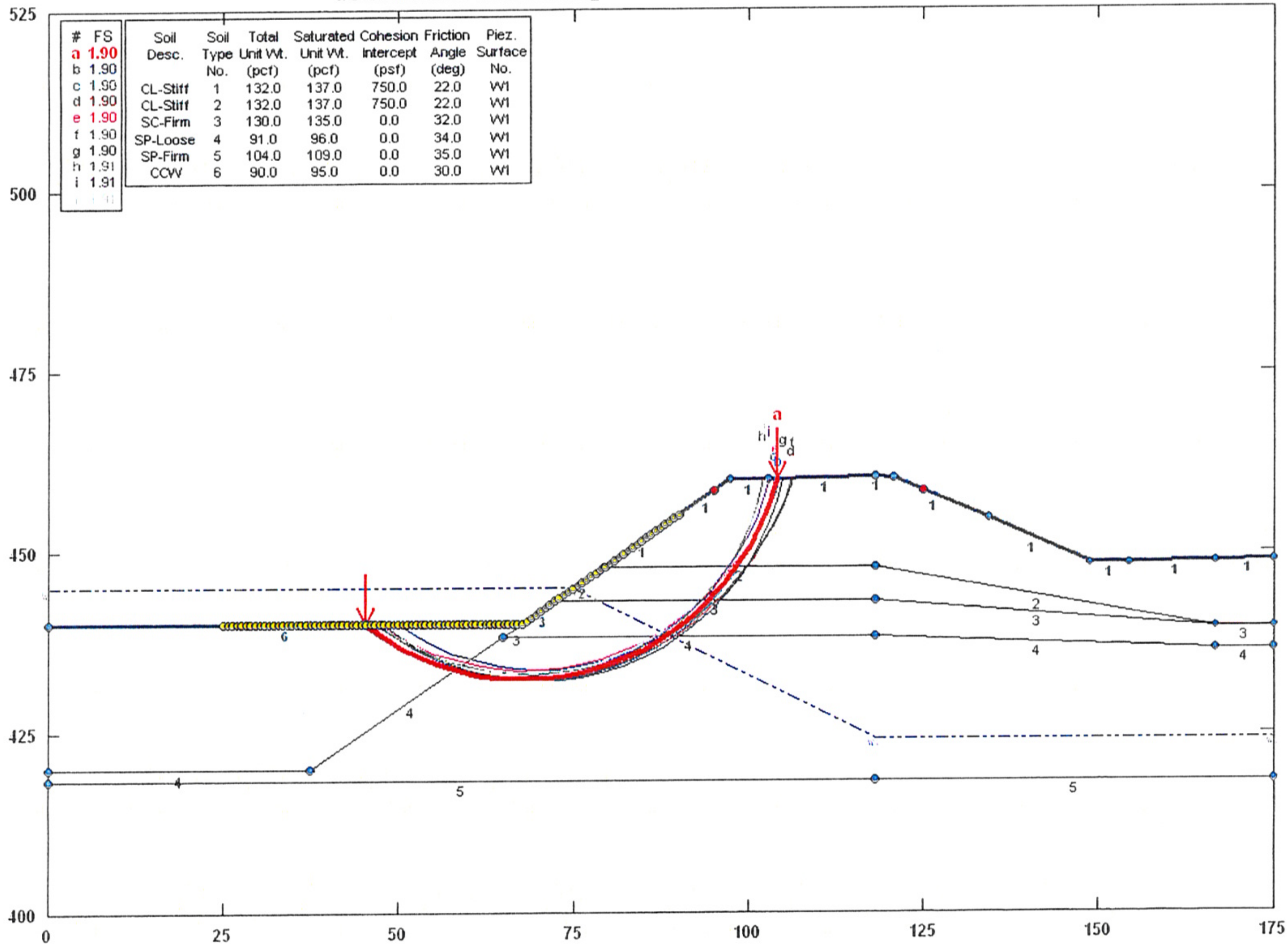
STABL6H FSmin=2.29

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 2, Upstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S2\UPSTREAM\2_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:27PM



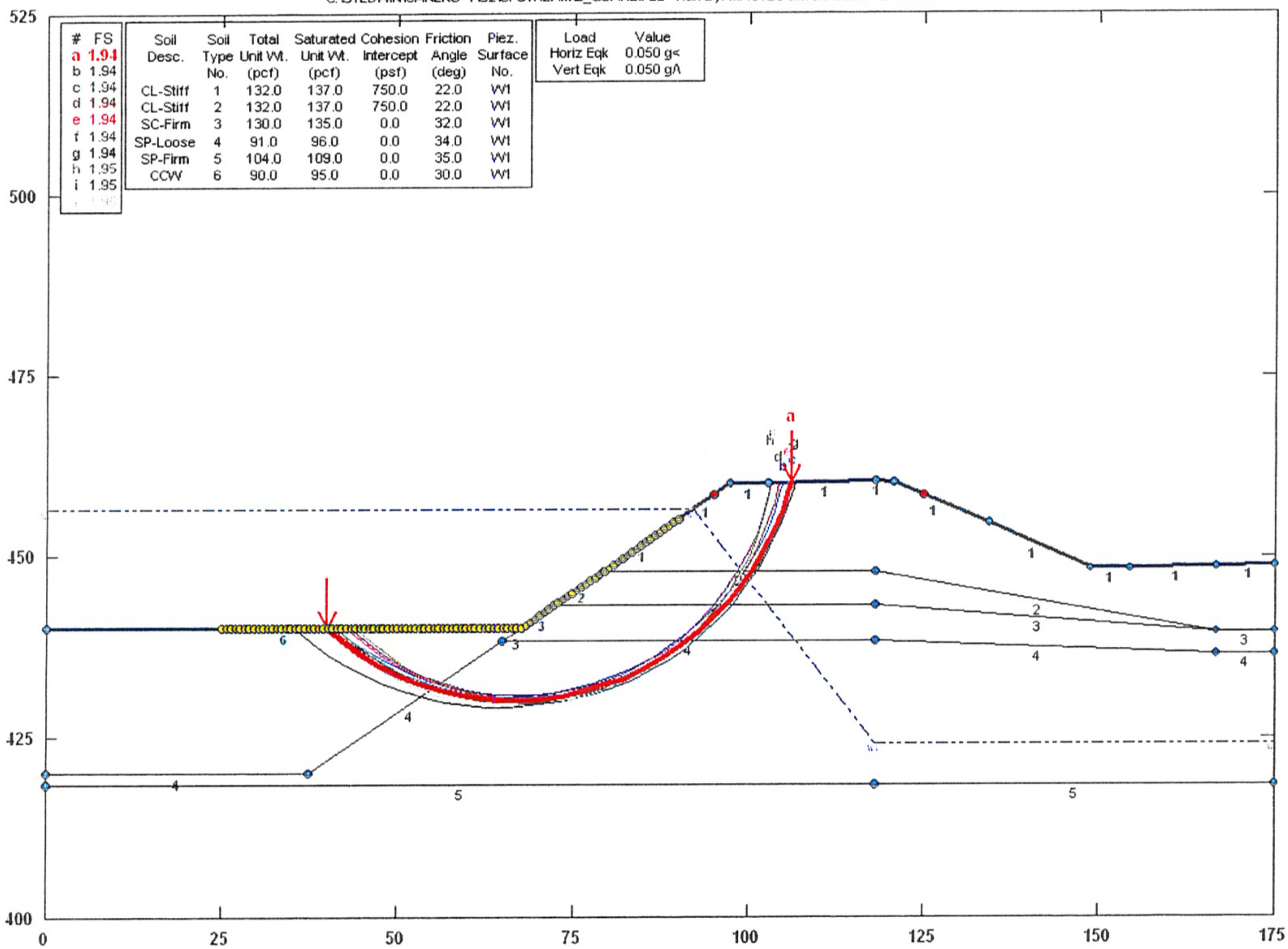
STABL6H FSmin=1.90

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 2, Upstream, Seismic

C:\STEDWIN\CANERU~1\S2\UPSTREAM\2_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 3:28PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Stiff	2	132.0	137.0	750.0	22.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
SP-Firm	5	104.0	109.0	0.0	35.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1

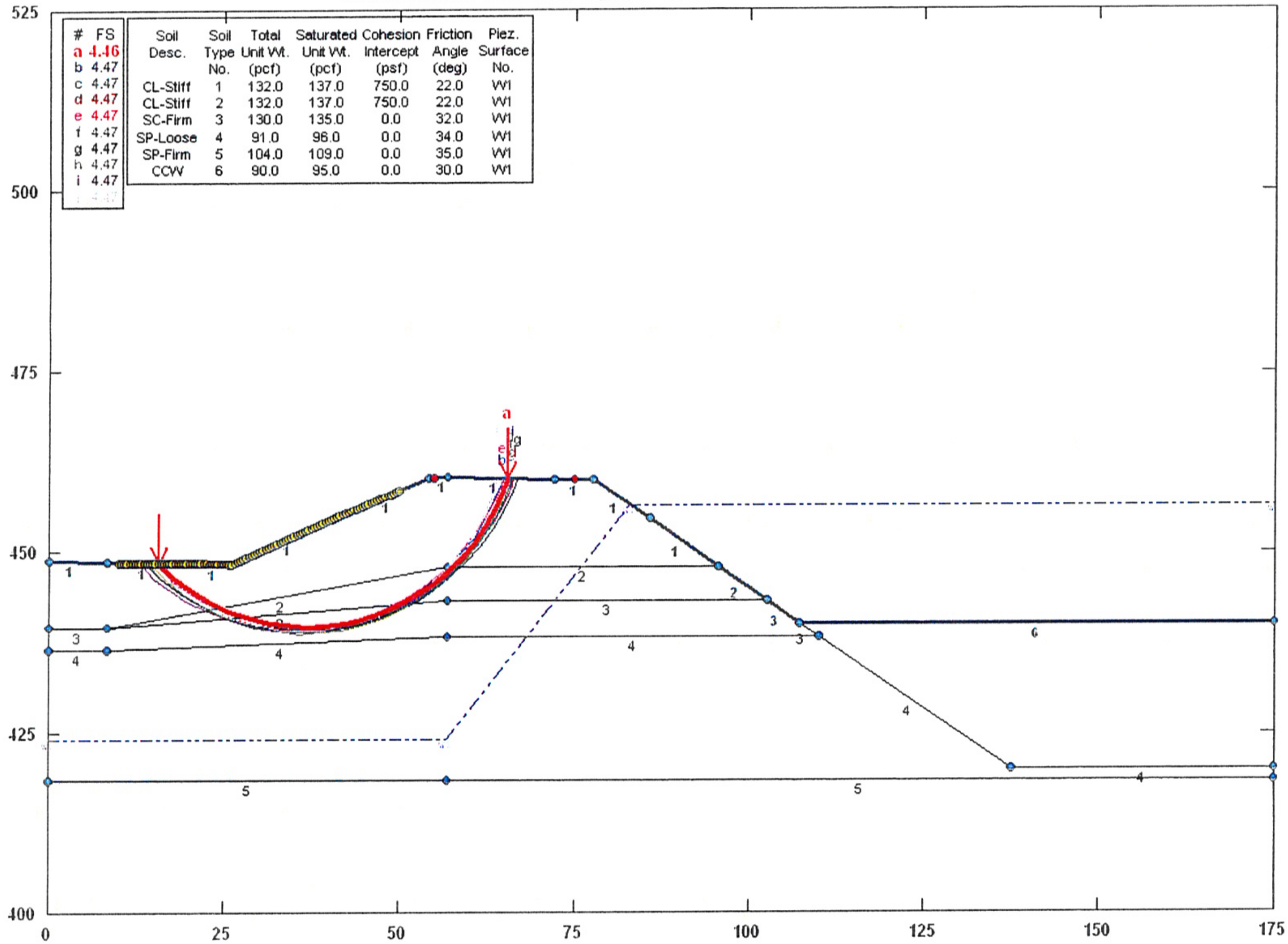
STABL6H FSmin=1.94

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 2, Downstream, Steady-State

C:\STEDWIN\CANERU~1\S2\DOWNST~1\2_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 3:31PM



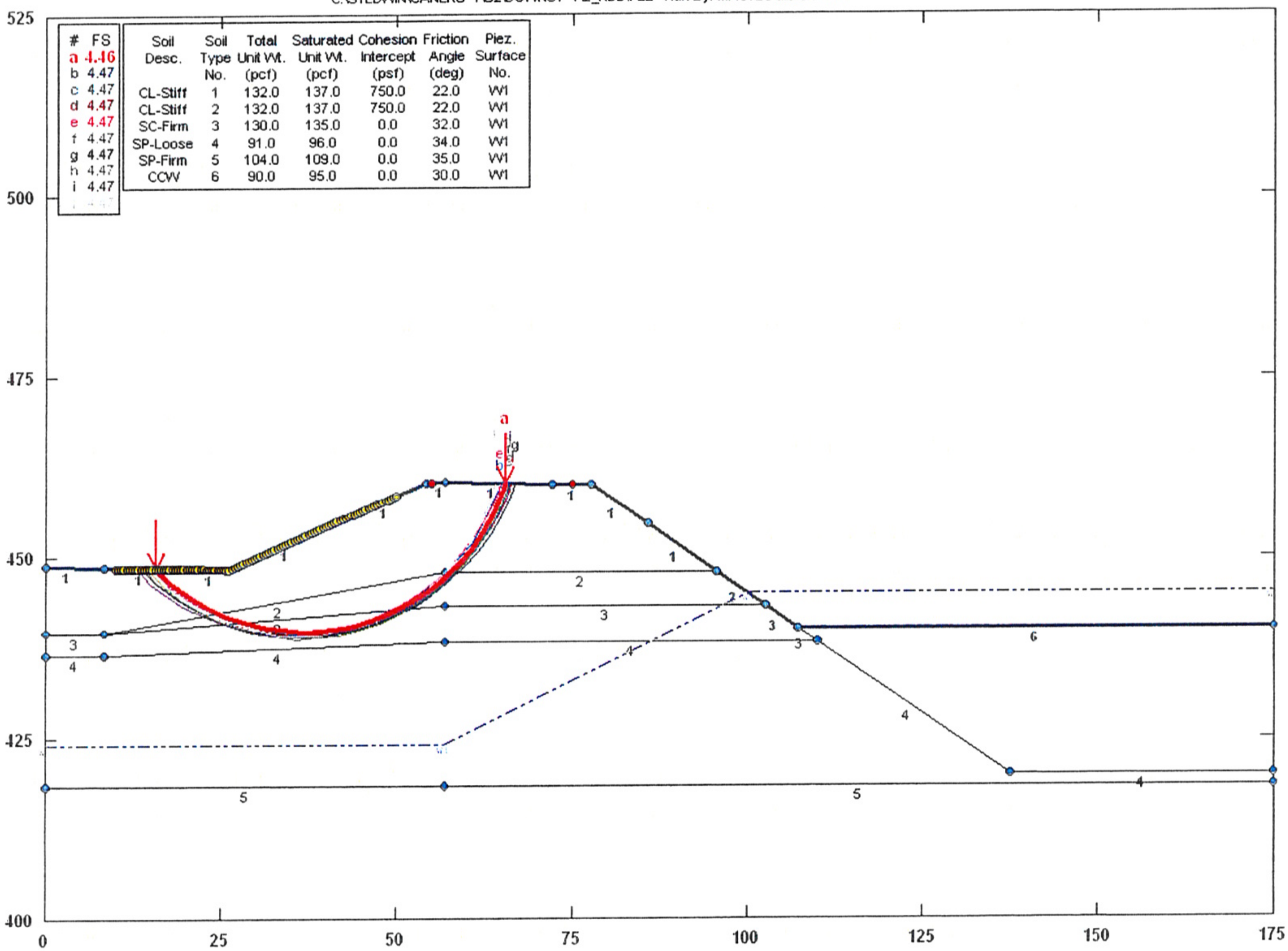
STABL6H FSmin=4.46

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 2, Downstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S2\DOWNST~1\2_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:32PM



#	FS
a	4.46
b	4.47
c	4.47
d	4.47
e	4.47
f	4.47
g	4.47
h	4.47
i	4.47

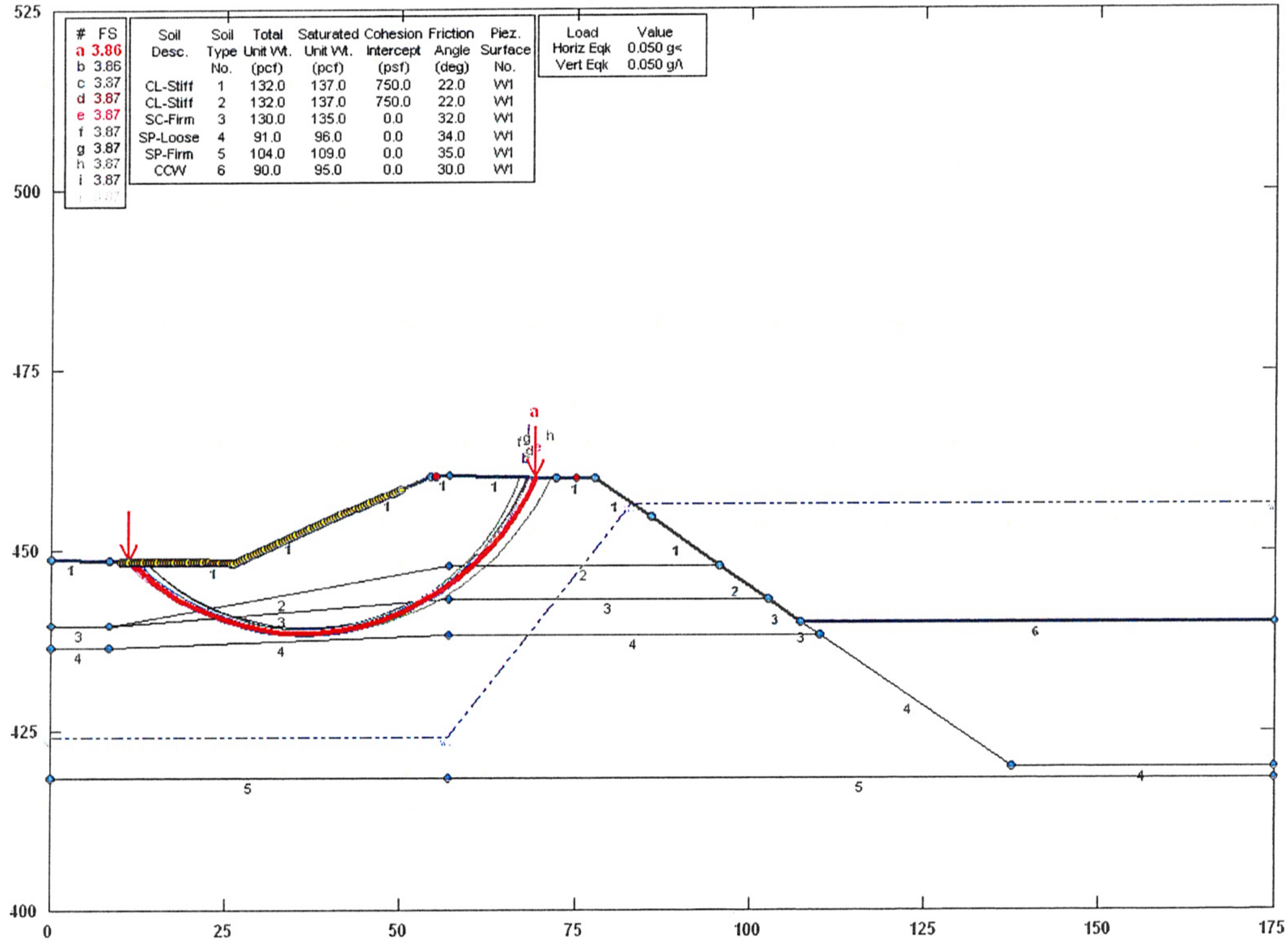
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Stiff	2	132.0	137.0	750.0	22.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
SP-Firm	5	104.0	109.0	0.0	35.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1

STABL6H FSmin=4.46
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 2, Downstream, Seismic

C:\STEDWIN\CANERU~1\S2\DOWNST~1\2_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 3:33PM



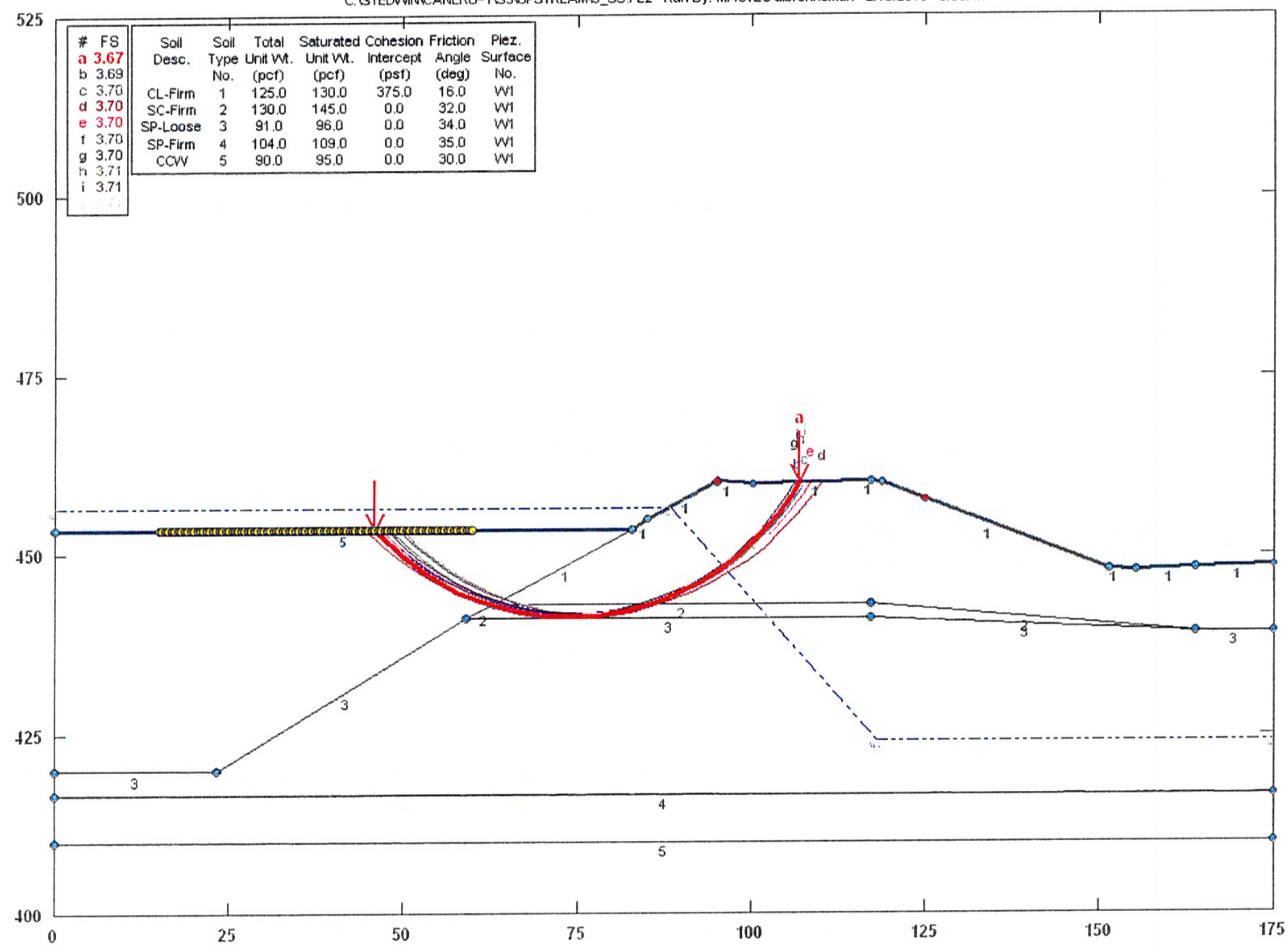
STABL6H FSmin=3.86

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3, Upstream, Steady-State

C:\STEDWIN\CANERU~1\S3\UPSTREAM\3_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 3:35PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Firm	1	125.0	130.0	375.0	16.0	W1
SC-Firm	2	130.0	145.0	0.0	32.0	W1
SP-Loose	3	91.0	96.0	0.0	34.0	W1
SP-Firm	4	104.0	109.0	0.0	35.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

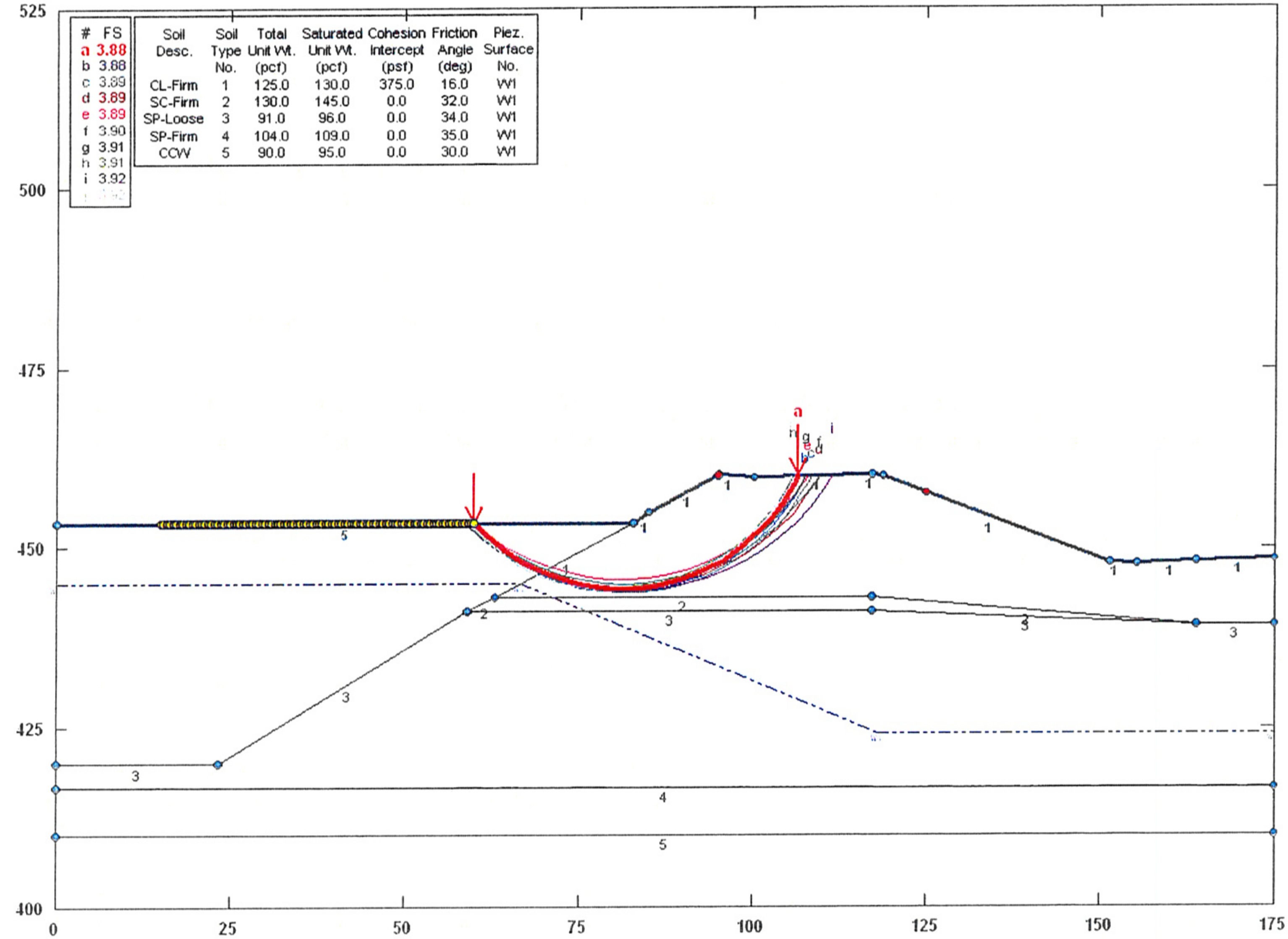
STABL6H FSmin=3.67

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3, Upstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S3\UPSTREAM\3_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:36PM



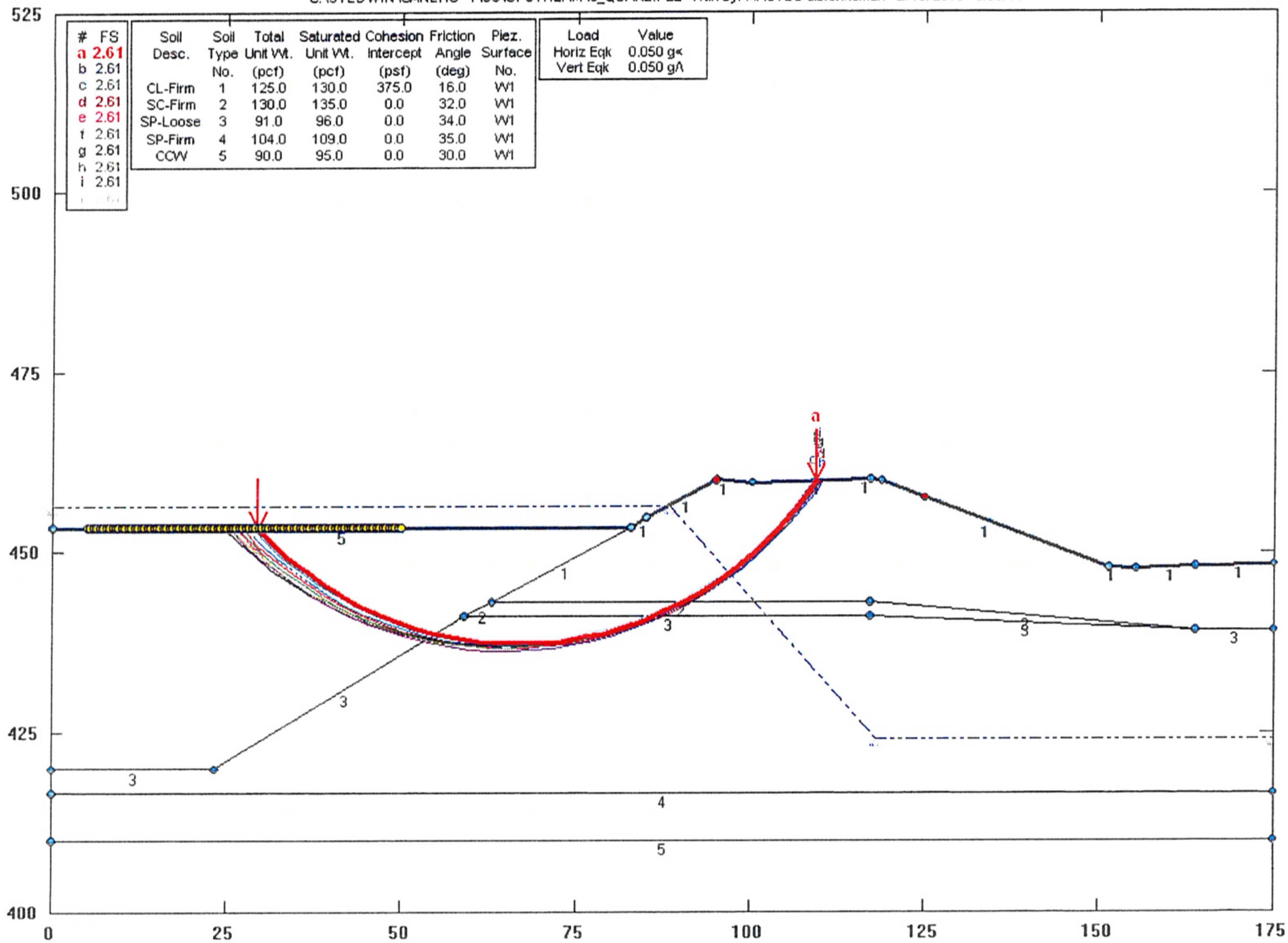
STABL6H FSmin=3.88

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3, Upstream, Seismic

C:\STEDWIN\CANERU~1\S3\UPSTREAM\3_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 3:38PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Firm	1	125.0	130.0	375.0	16.0	W1
SC-Firm	2	130.0	135.0	0.0	32.0	W1
SP-Loose	3	91.0	96.0	0.0	34.0	W1
SP-Firm	4	104.0	109.0	0.0	35.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

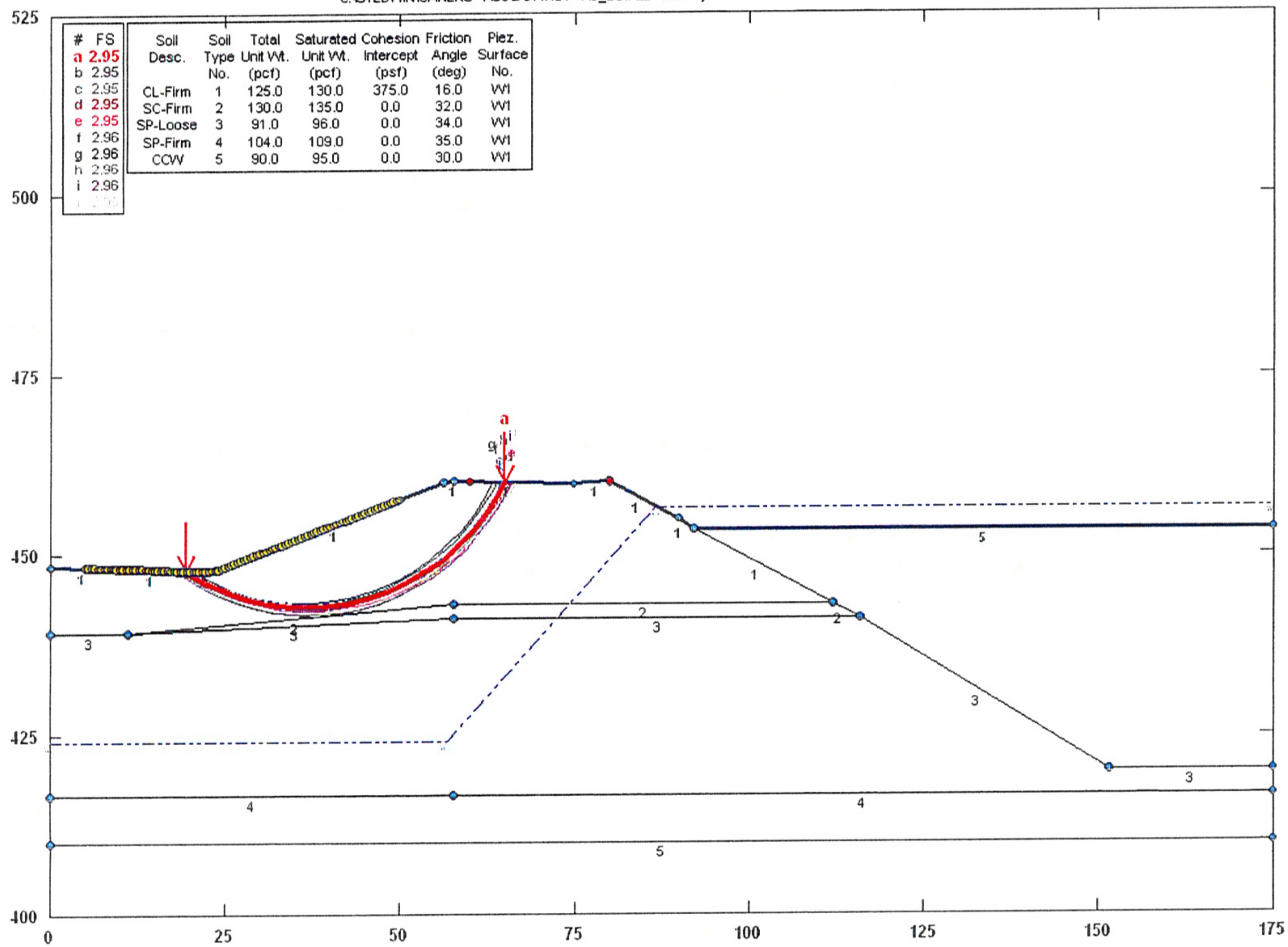
STABL6H FSmin=2.61

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3, Downstream, Steady-State

C:\STEDWIN\CANERU~1\S3\DOWNST~1\3_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 3:40PM



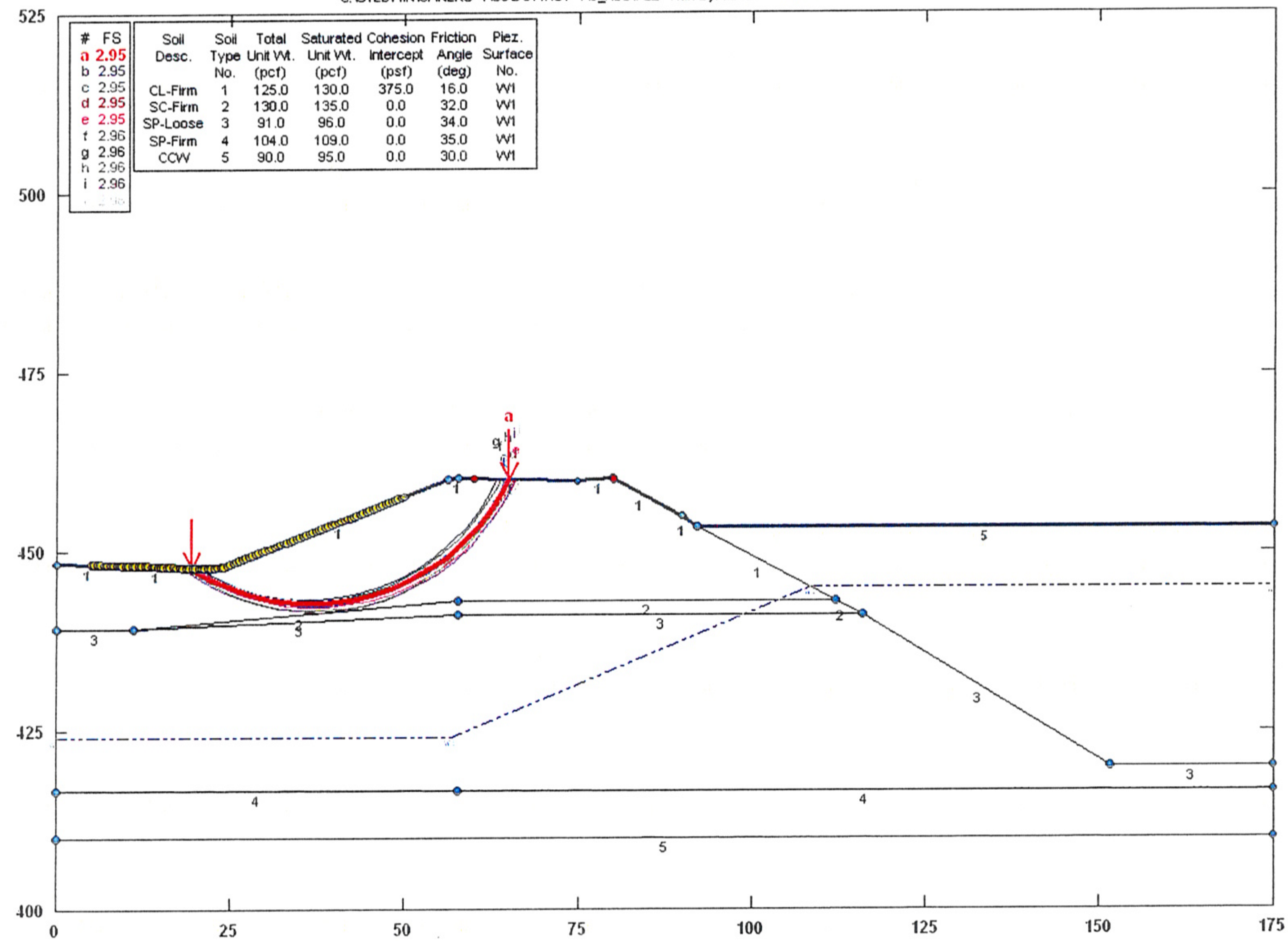
STABL6H FSmin=2.95

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3, Downstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S3\DOWNST~1\3_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:41PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Firm	1	125.0	130.0	375.0	16.0	W1
SC-Firm	2	130.0	135.0	0.0	32.0	W1
SP-Loose	3	91.0	96.0	0.0	34.0	W1
SP-Firm	4	104.0	109.0	0.0	35.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

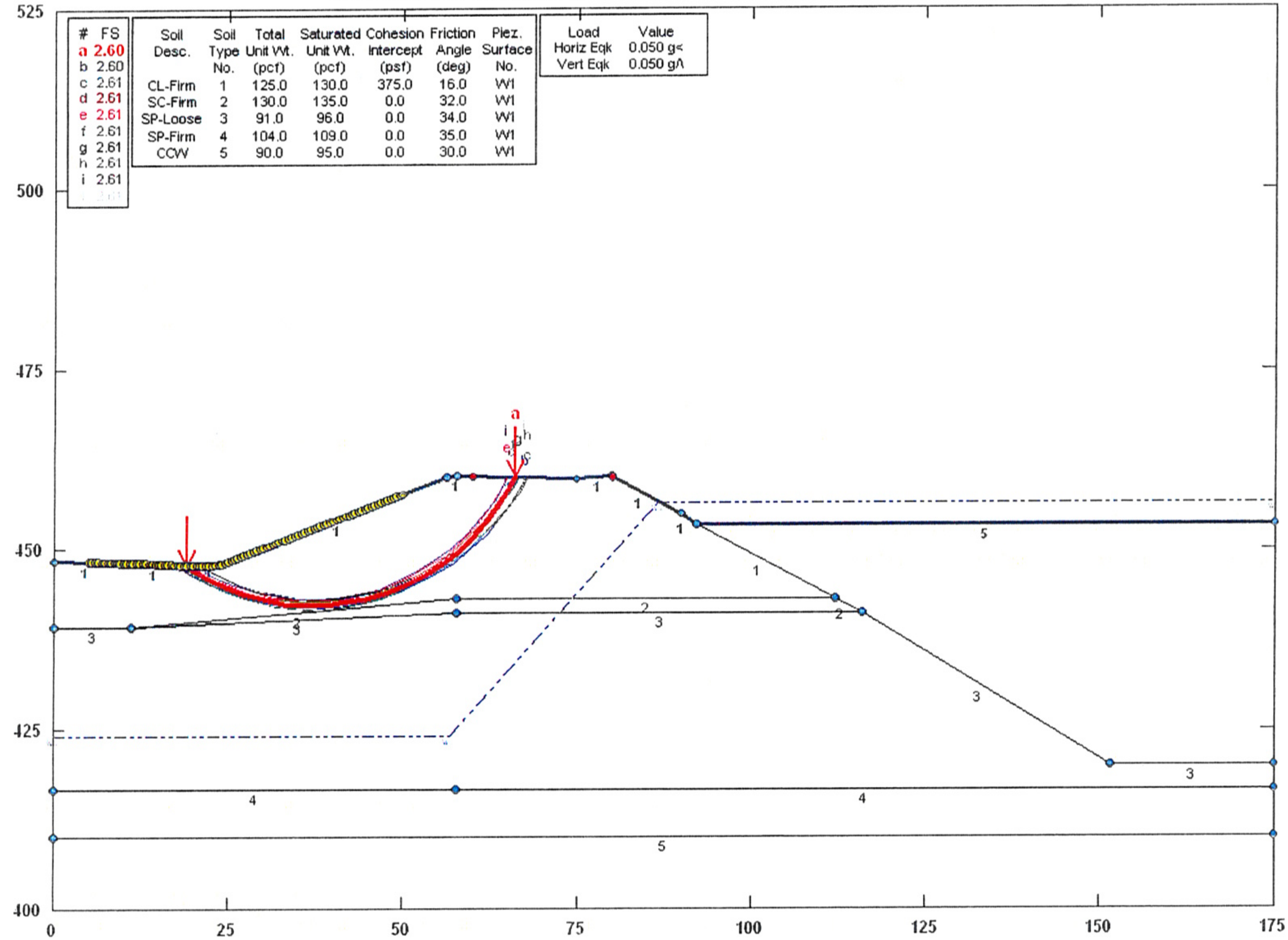
STABL6H FSmin=2.95

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3, Downstream, Seismic

C:\STEDWIN\CANERU~1\S3\DOWNST~1\3_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 3:42PM



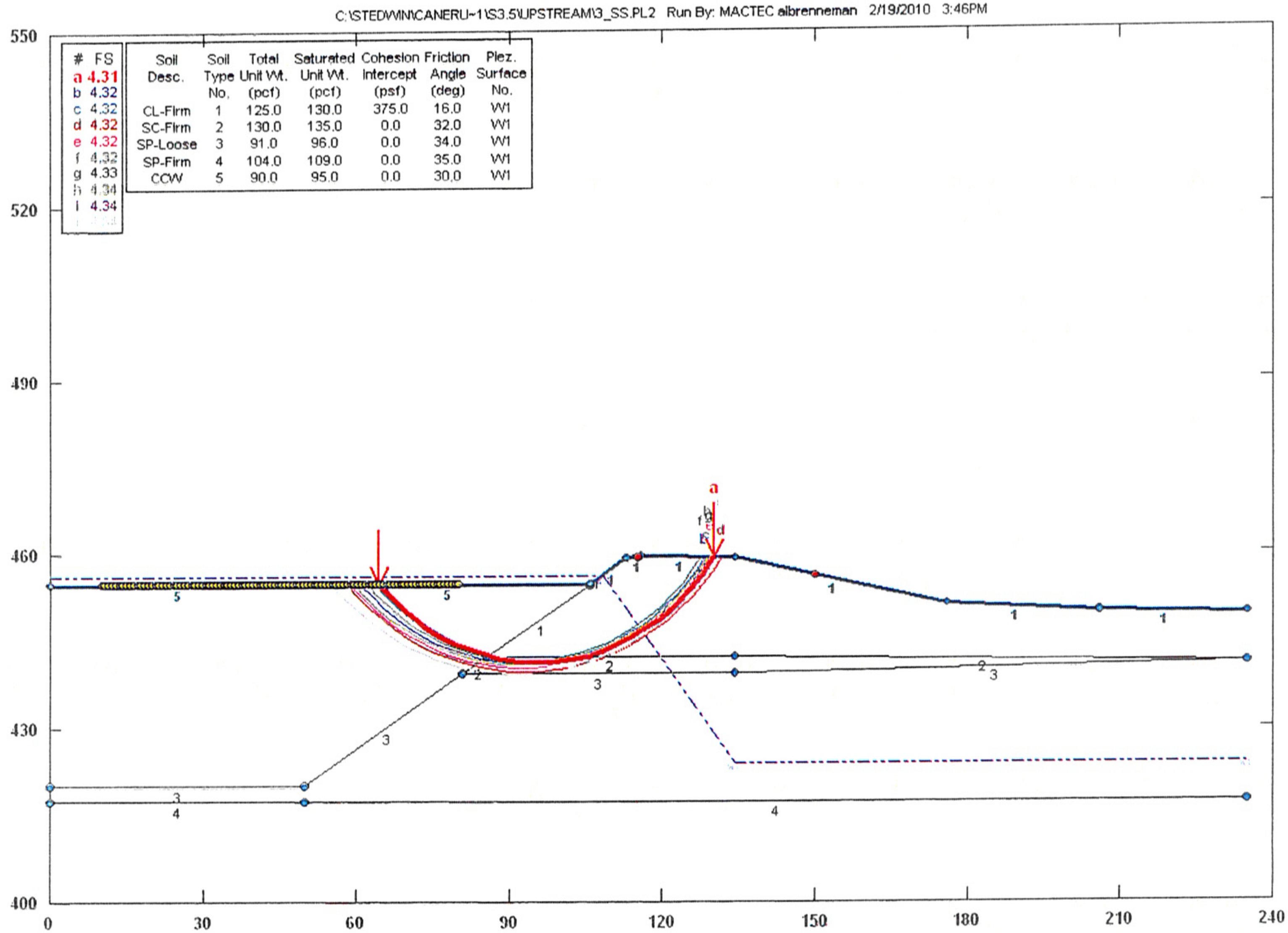
STABL6H FSmin=2.60

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3.5, Upstream, Steady-State

C:\STEDWIN\CANERU~1\S3.5\UPSTREAM\3_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 3:46PM



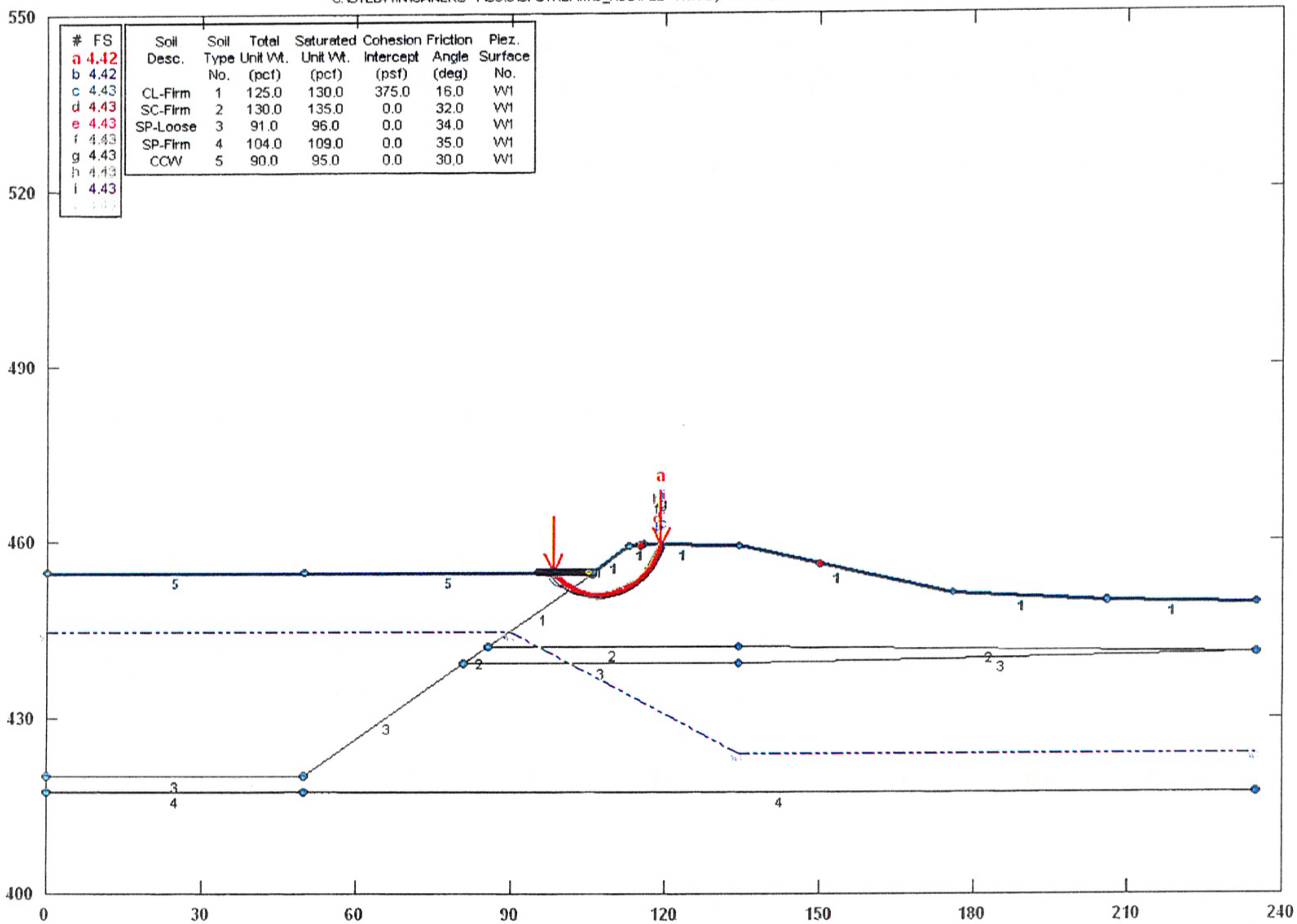
STABL6H FSmin=4.31

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3.5, Upstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S3.5\UPSTREAM\3_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:50PM



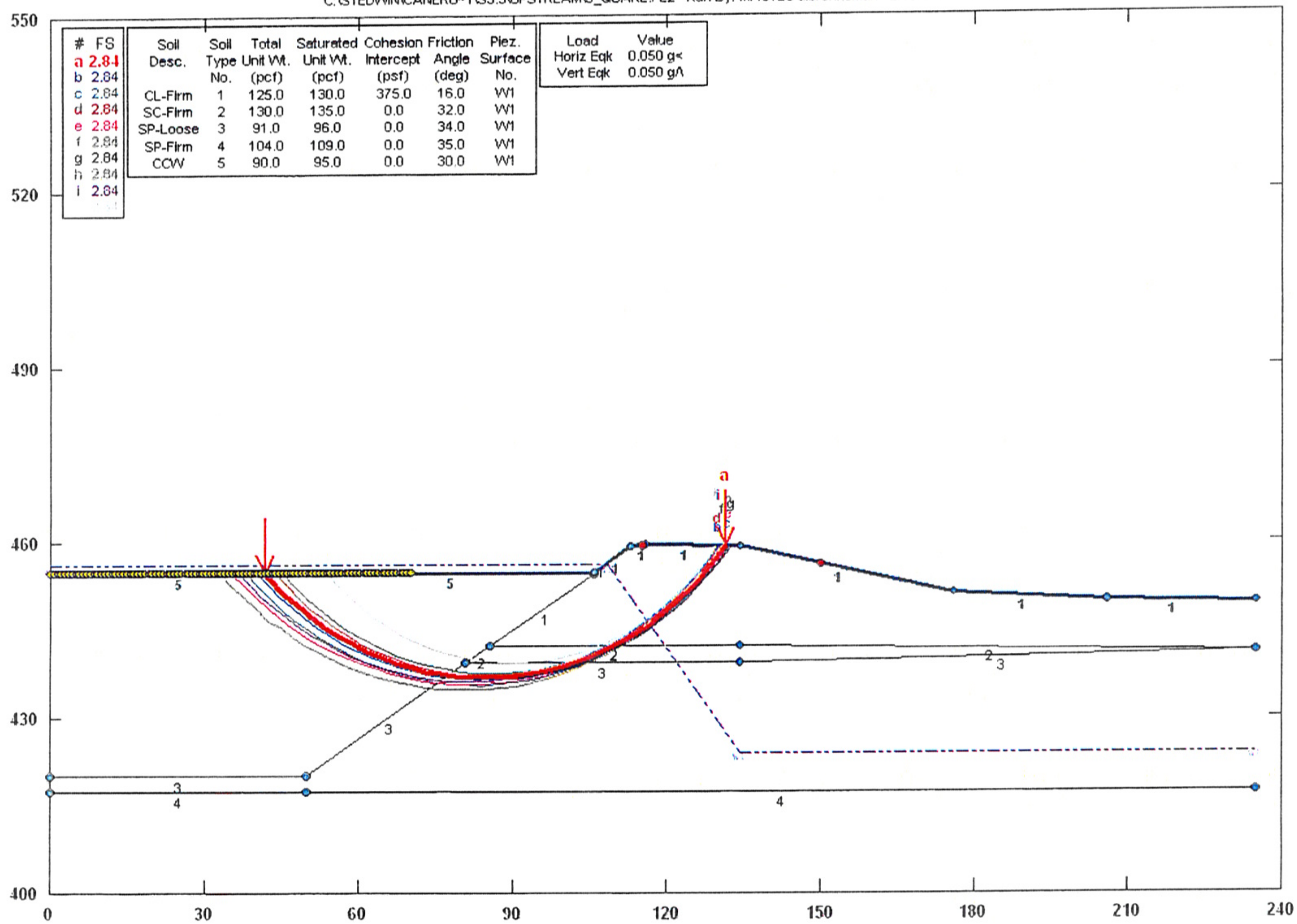
STABL6H FSmin=4.42

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3.5, Upstream, Seismic

C:\STEDWIN\CANERU~1\S3.5\UPSTREAM\3_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 3:52PM



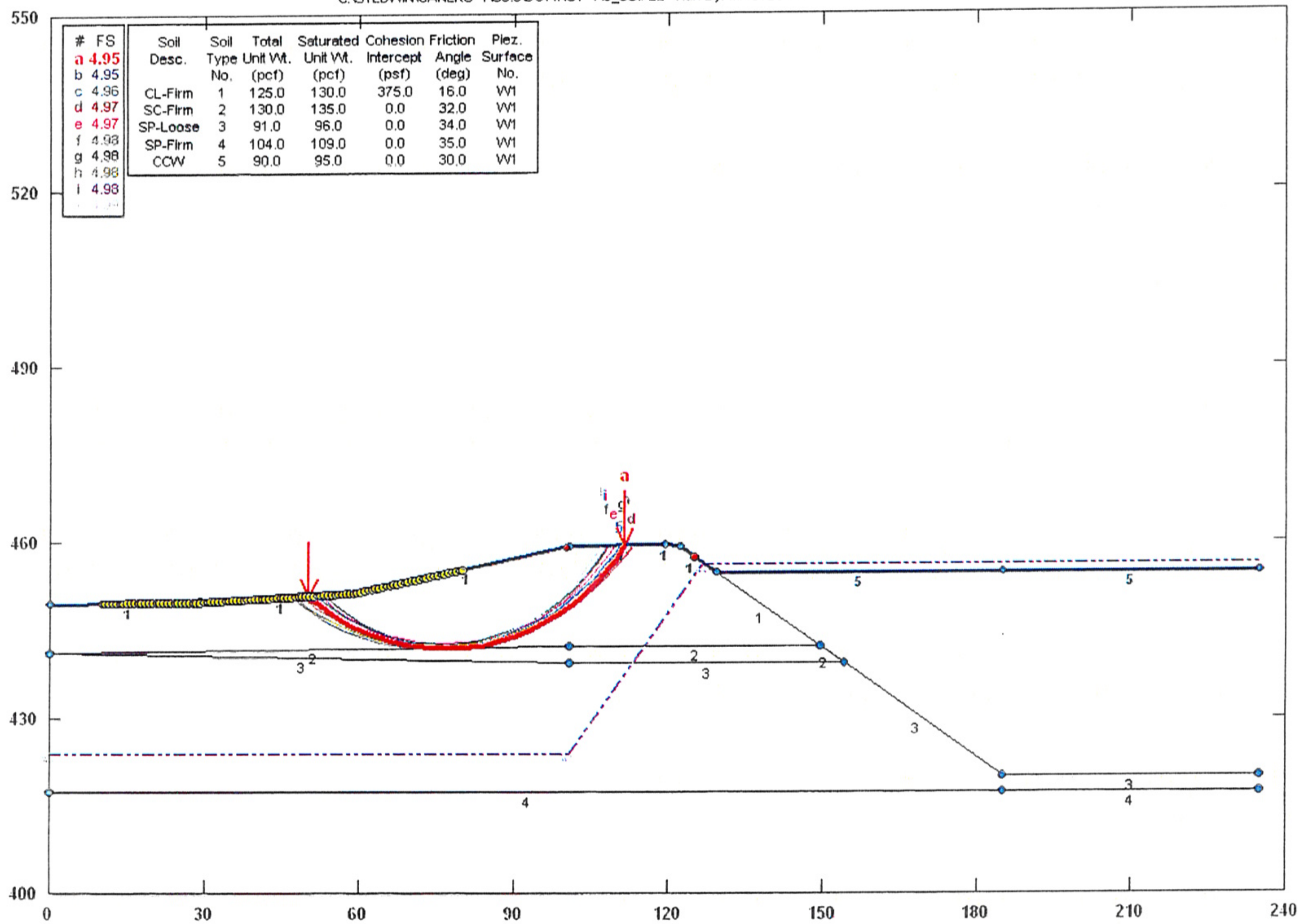
STABL6H FSmin=2.84

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3.5, Downstream, Steady-State

C:\STEDWIN\CANERU~1\S3.5\DOWNST~1\3_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 3:54PM



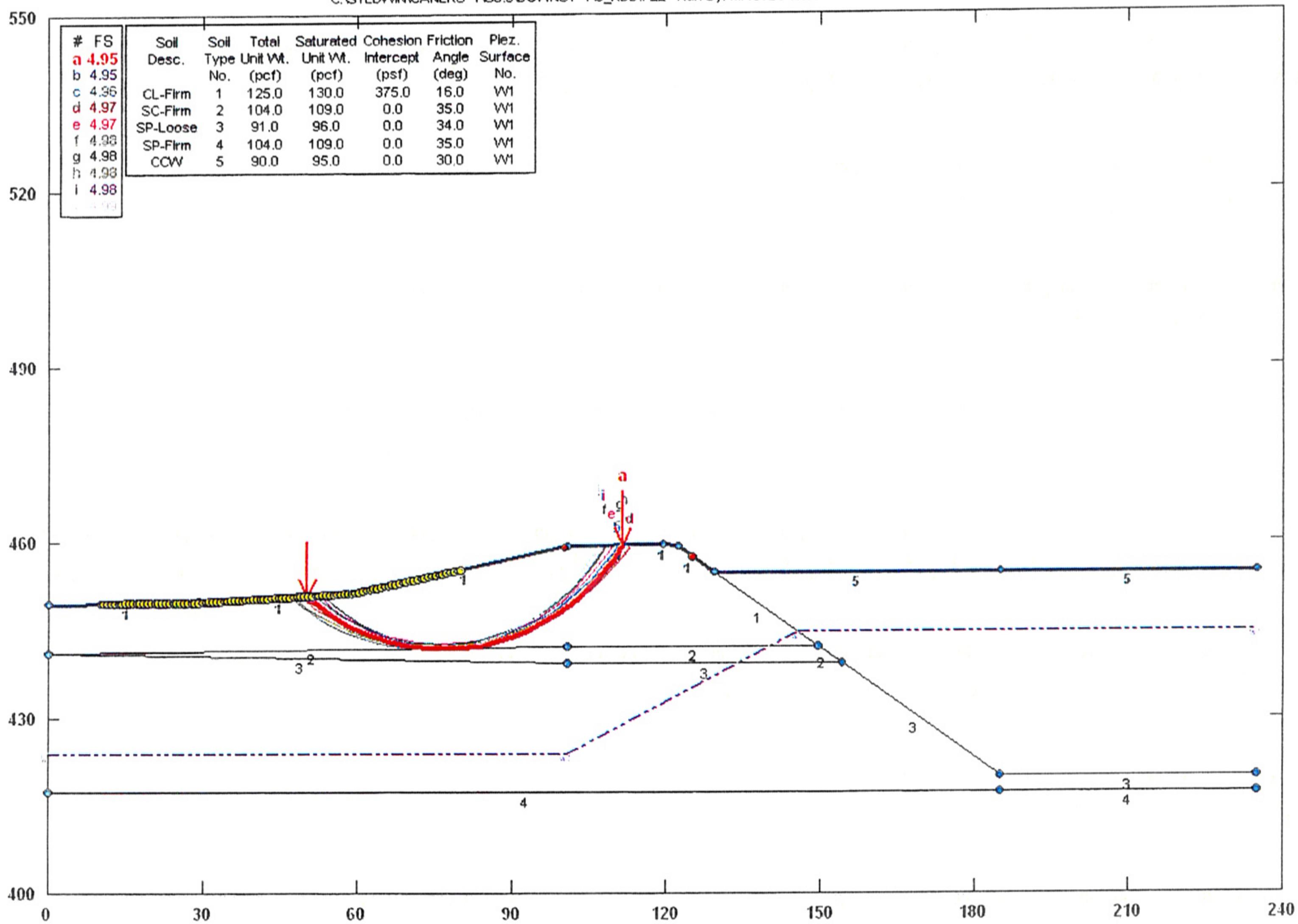
STABL6H FSmin=4.95

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3.5, Downstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S3.5\DOWNST~1\3_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:55PM

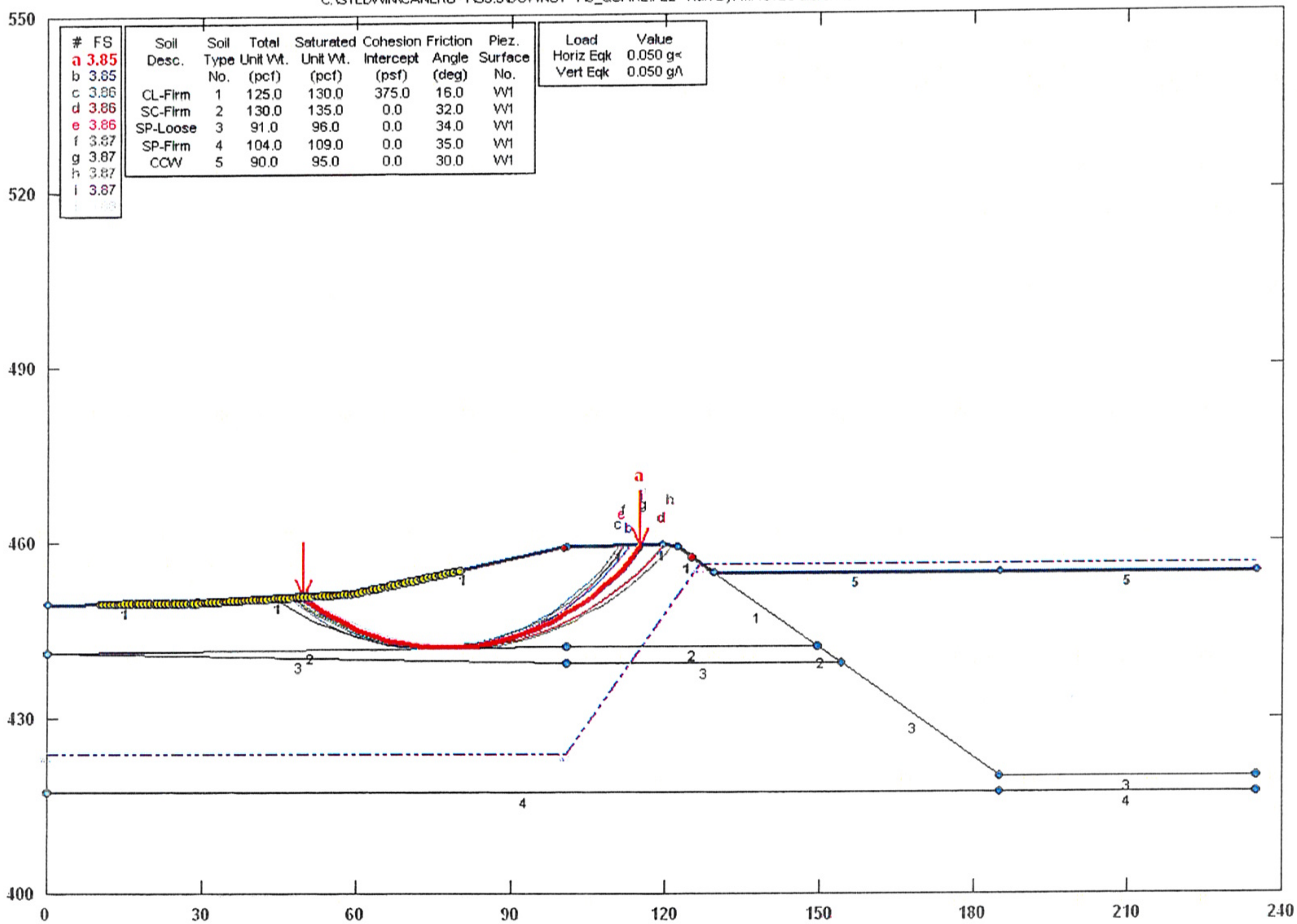


STABL6H FSmin=4.95
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 3.5, Downstream, Seismic

C:\STEDWIN\CANERU~1\S3.5\DOWNST~1\3_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 3:56PM



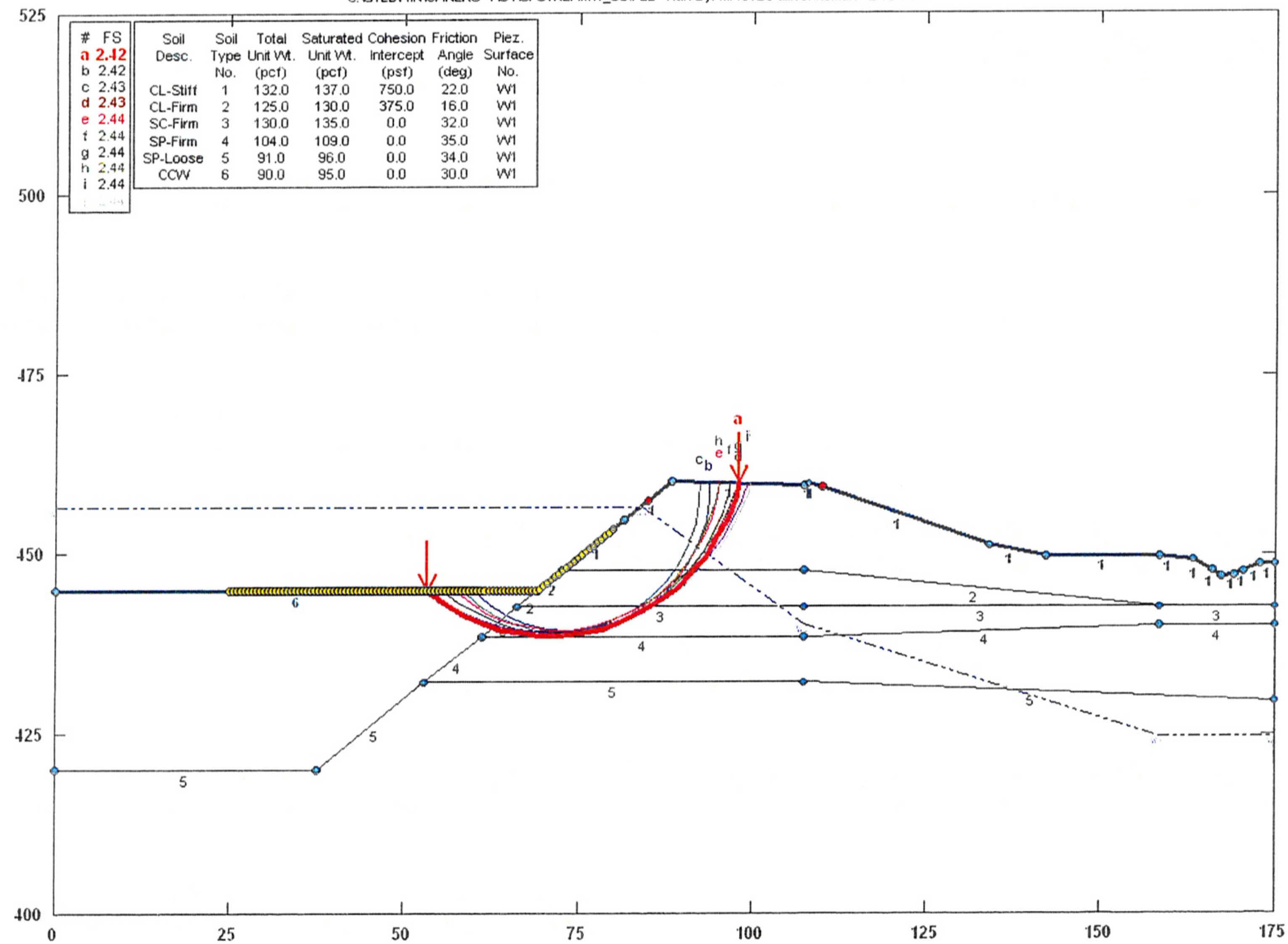
STABL6H FSmin=3.85

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 4, Upstream, Steady-State

C:\STEDWIN\CANERU~1\S4\UPSTREAM\4_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 3:21PM



#	FS
a	2.42
b	2.42
c	2.43
d	2.43
e	2.44
f	2.44
g	2.44
h	2.44
i	2.44

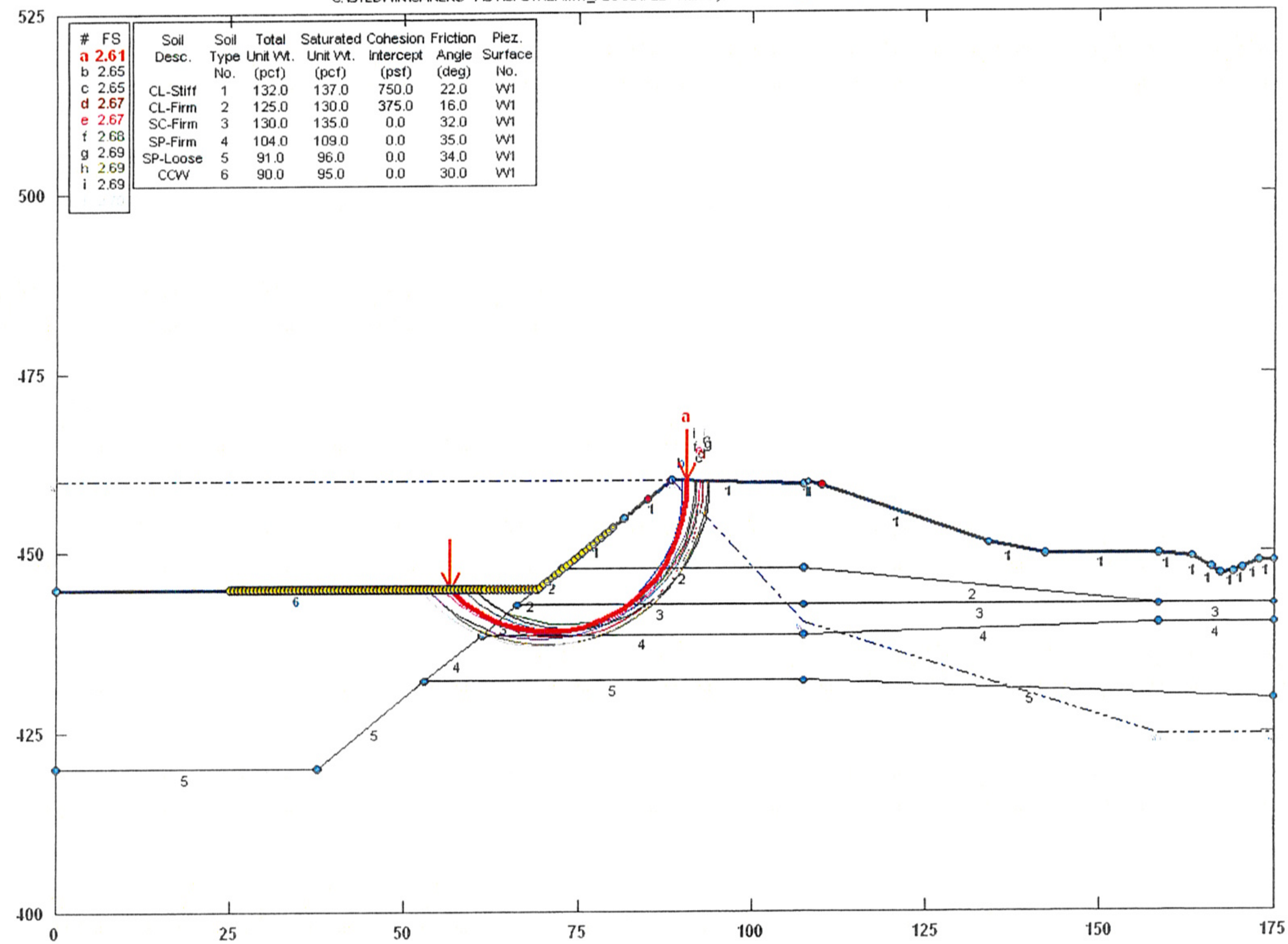
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Firm	2	125.0	130.0	375.0	16.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Firm	4	104.0	109.0	0.0	35.0	W1
SP-Loose	5	91.0	96.0	0.0	34.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1

STABL6H FSmin=2.42
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 4, Upstream, Maximum Surcharge Pool

C:\STEDWIN\CANERU~1\S4\UPSTREAM4_FLOOD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:10PM



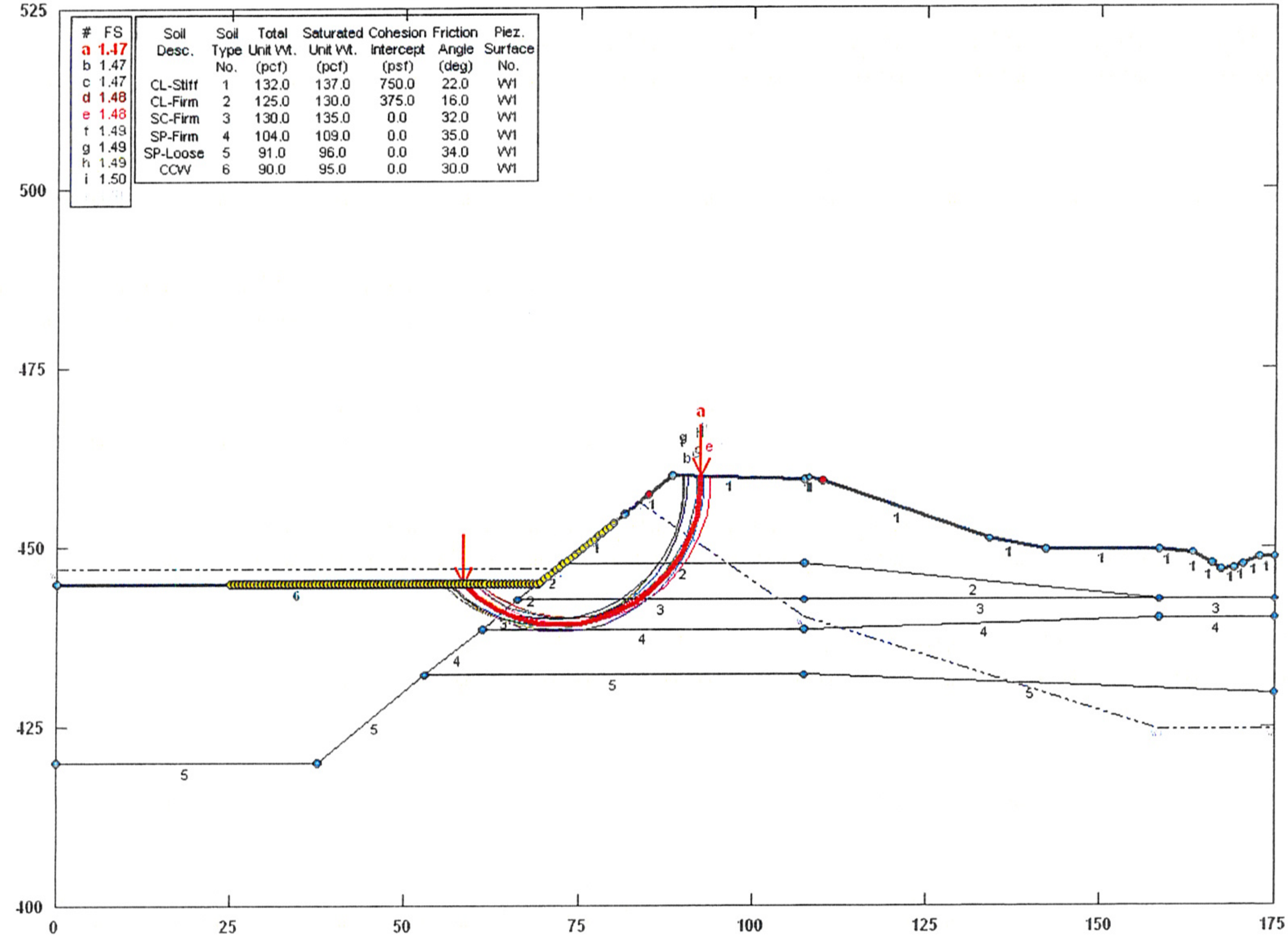
STABL6H FSmin=2.61

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 4, Upstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S4\UPSTREAM\4_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:11PM

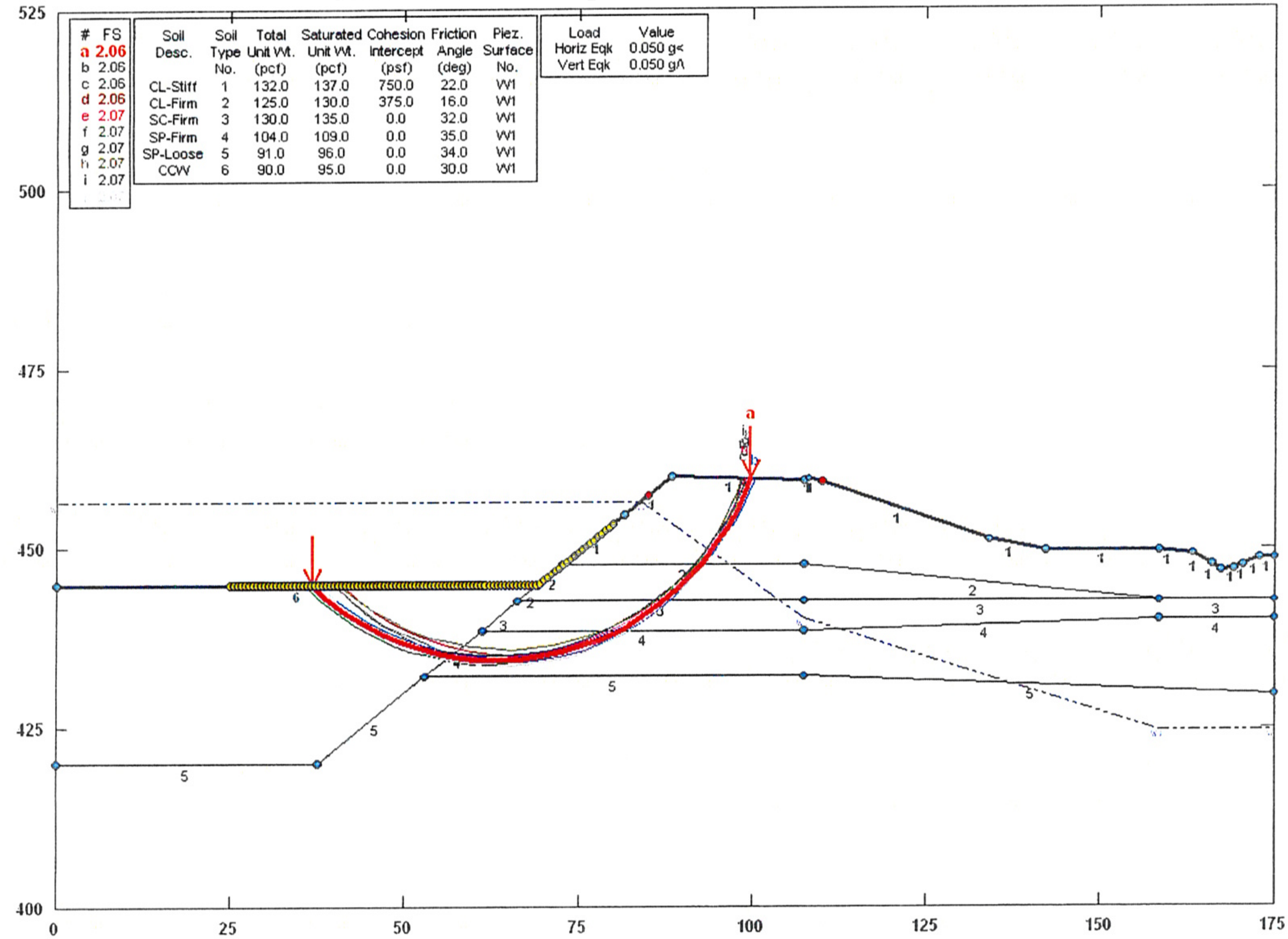


STABL6H FSmin=1.47

Safety Factors Are Calculated By The Modified Bishop Method

Cane Run Station: Section 4, Upstream, Seismic

C:\STEDWIN\CANERU~1\S4\UPSTREAM4_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 3:12PM

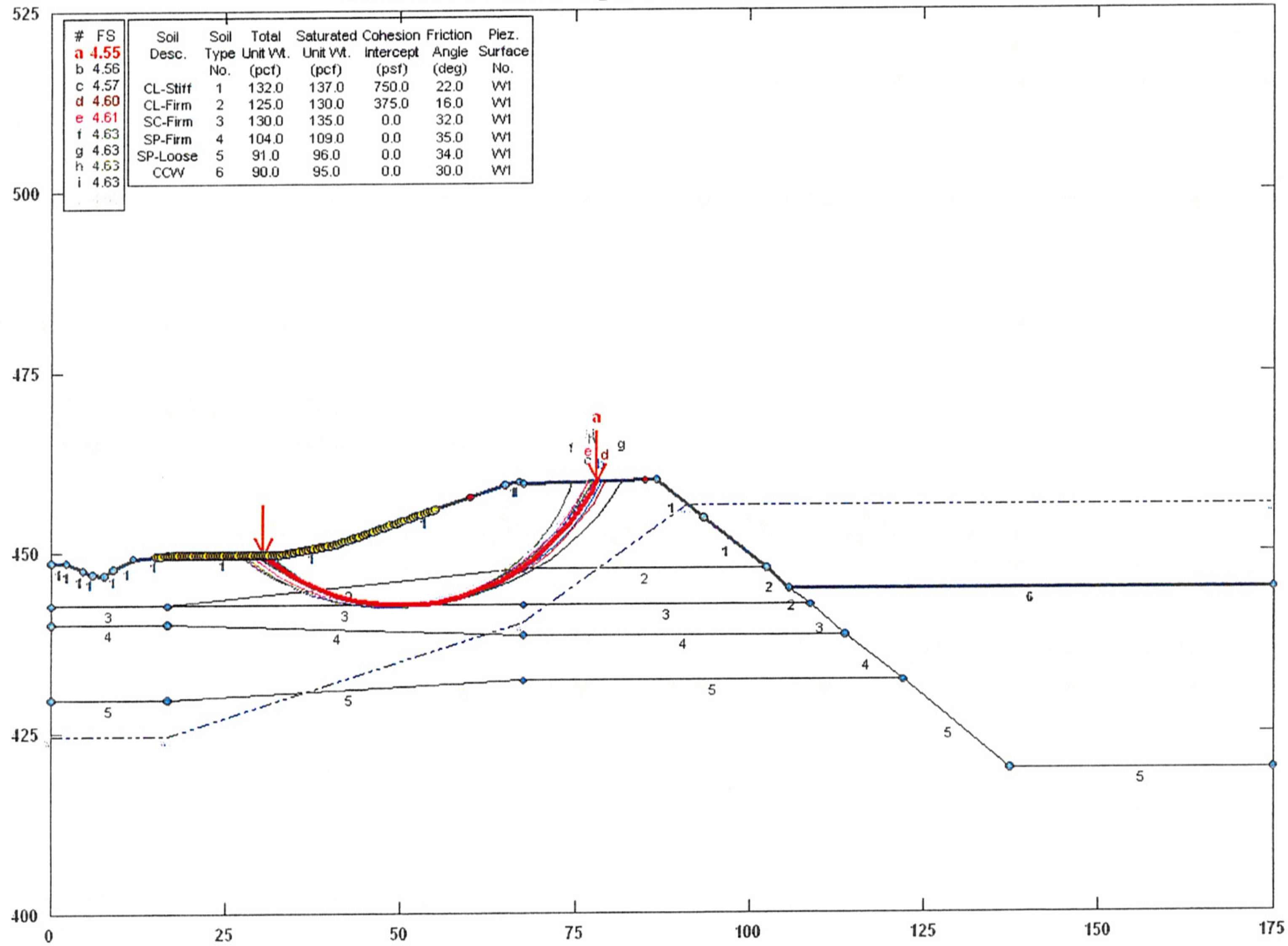


STABL6H FSmin=2.06
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 4, Downstream, Steady-State

C:\STEDWIN\CANERU~1\S4\DOWNST~1\4_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 3:13PM



#	FS
a	4.55
b	4.56
c	4.57
d	4.60
e	4.61
f	4.63
g	4.63
h	4.63
i	4.63

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Firm	2	125.0	130.0	375.0	16.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Firm	4	104.0	109.0	0.0	35.0	W1
SP-Loose	5	91.0	96.0	0.0	34.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1

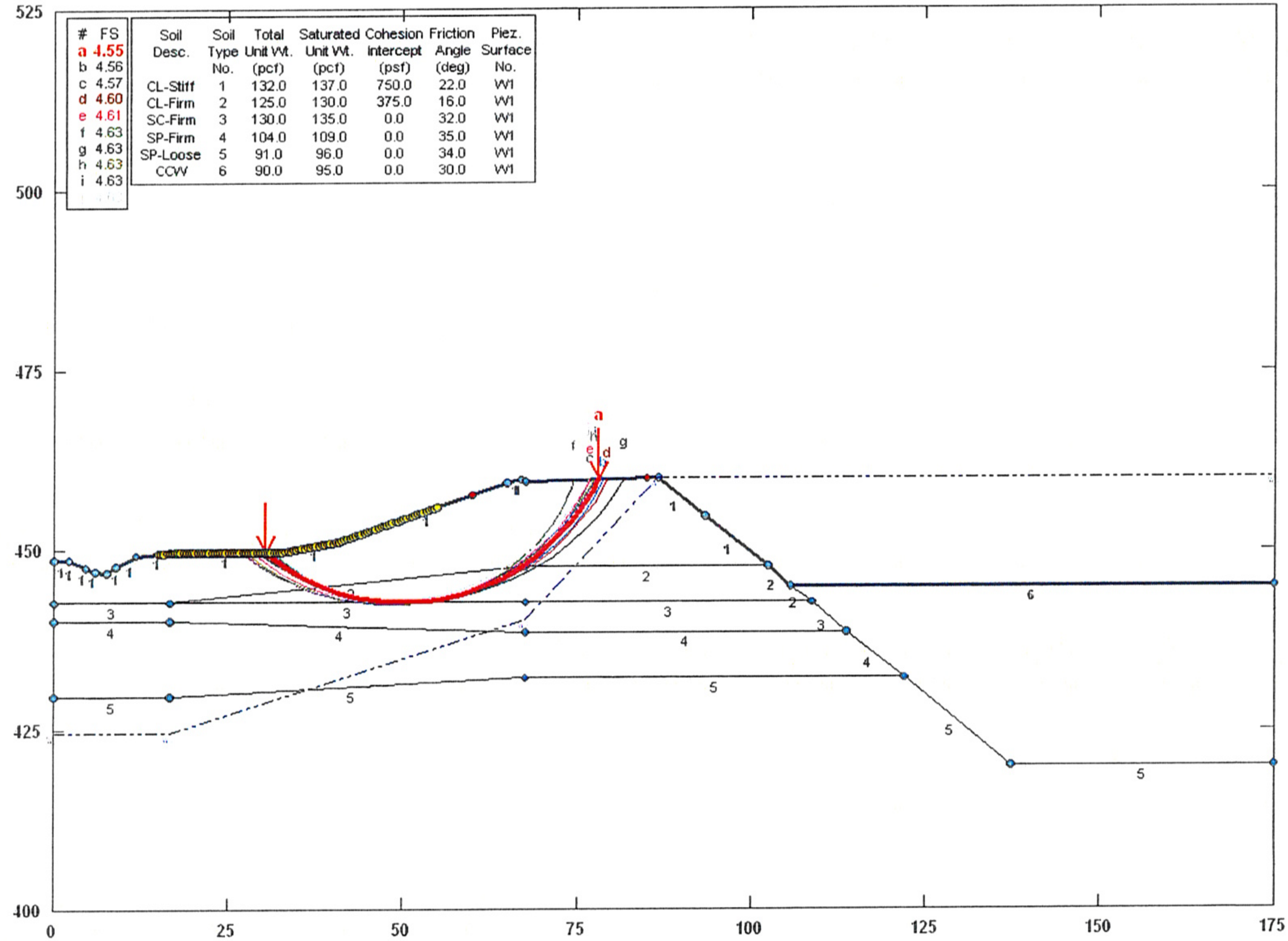
STABL6H FSmin=4.55

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 4, Downstream, Maximum Surcharge Pool

C:\STEDWIN\CANERU~1\S4\DOWNST~1\4_FLOOD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:14PM



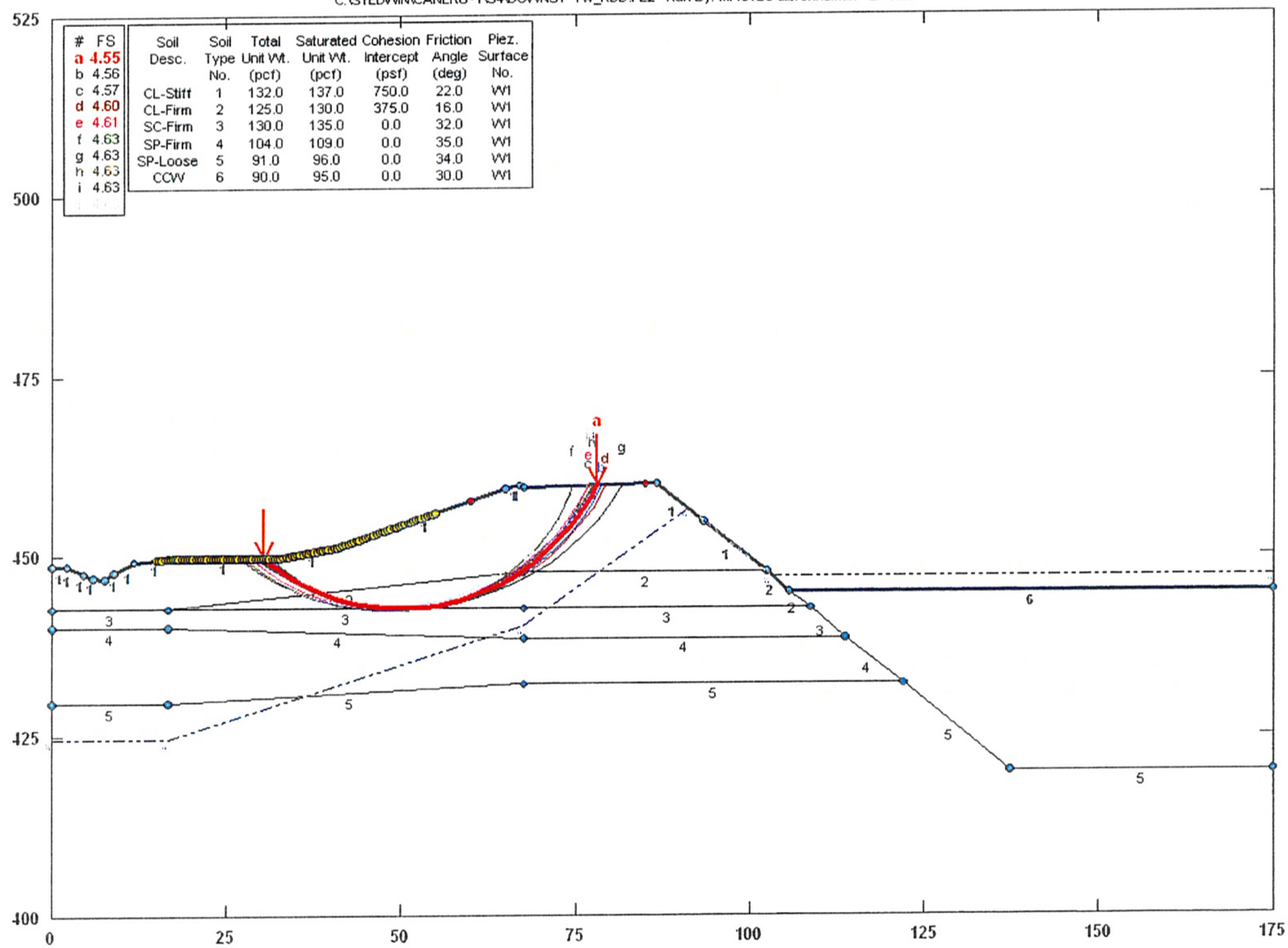
STABL6H FSmin=4.55

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 4, Downstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S4\DOWNST~1\4_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 3:18PM



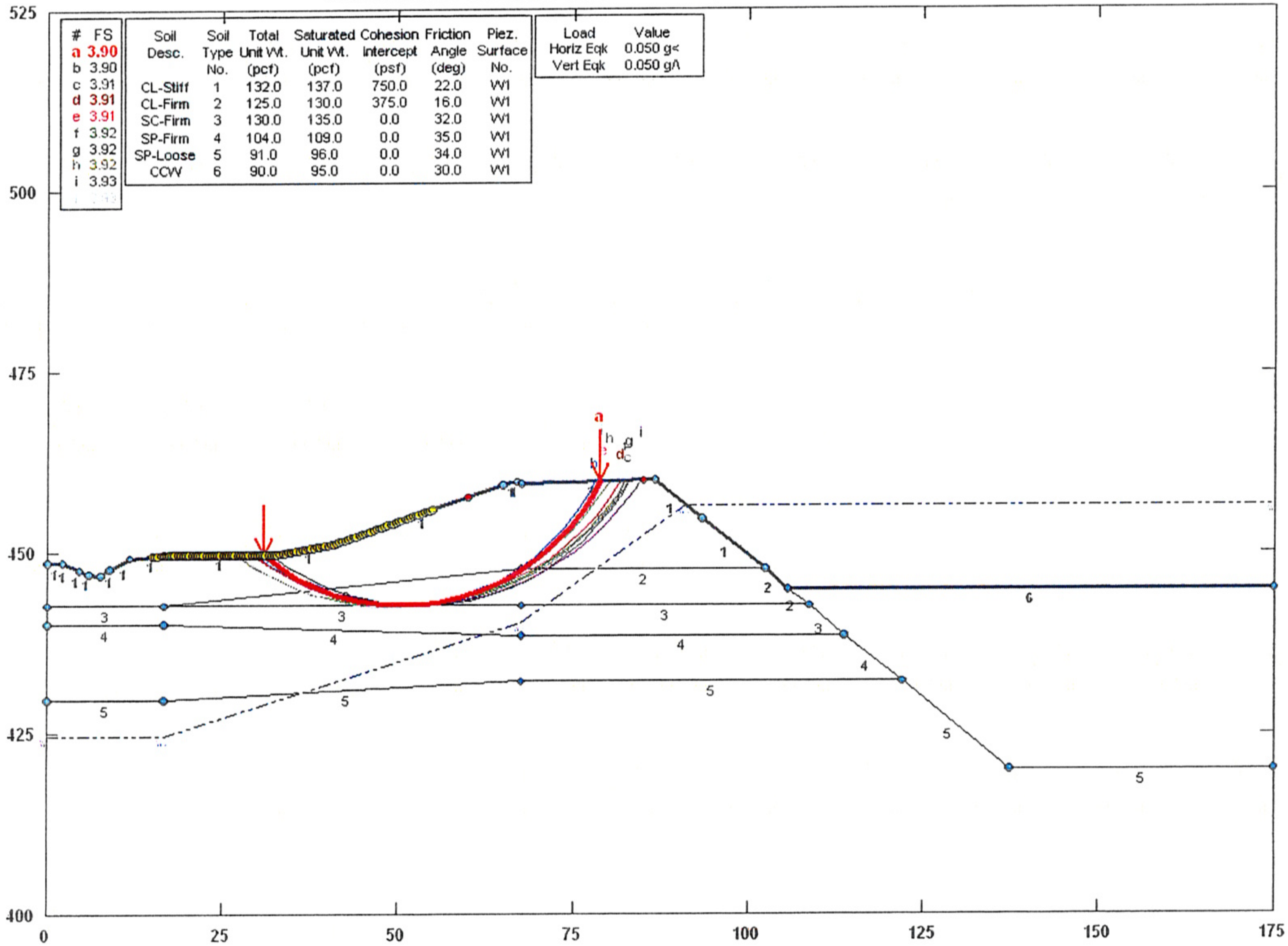
STABL6H FSmin=4.55

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 4, Downstream, Seismic

C:\STEDWIN\CANERU~1\S4\DOWNST~1\4_QUAKE.PL2 Run By: MACTEC aibrenneman 2/19/2010 3:16PM



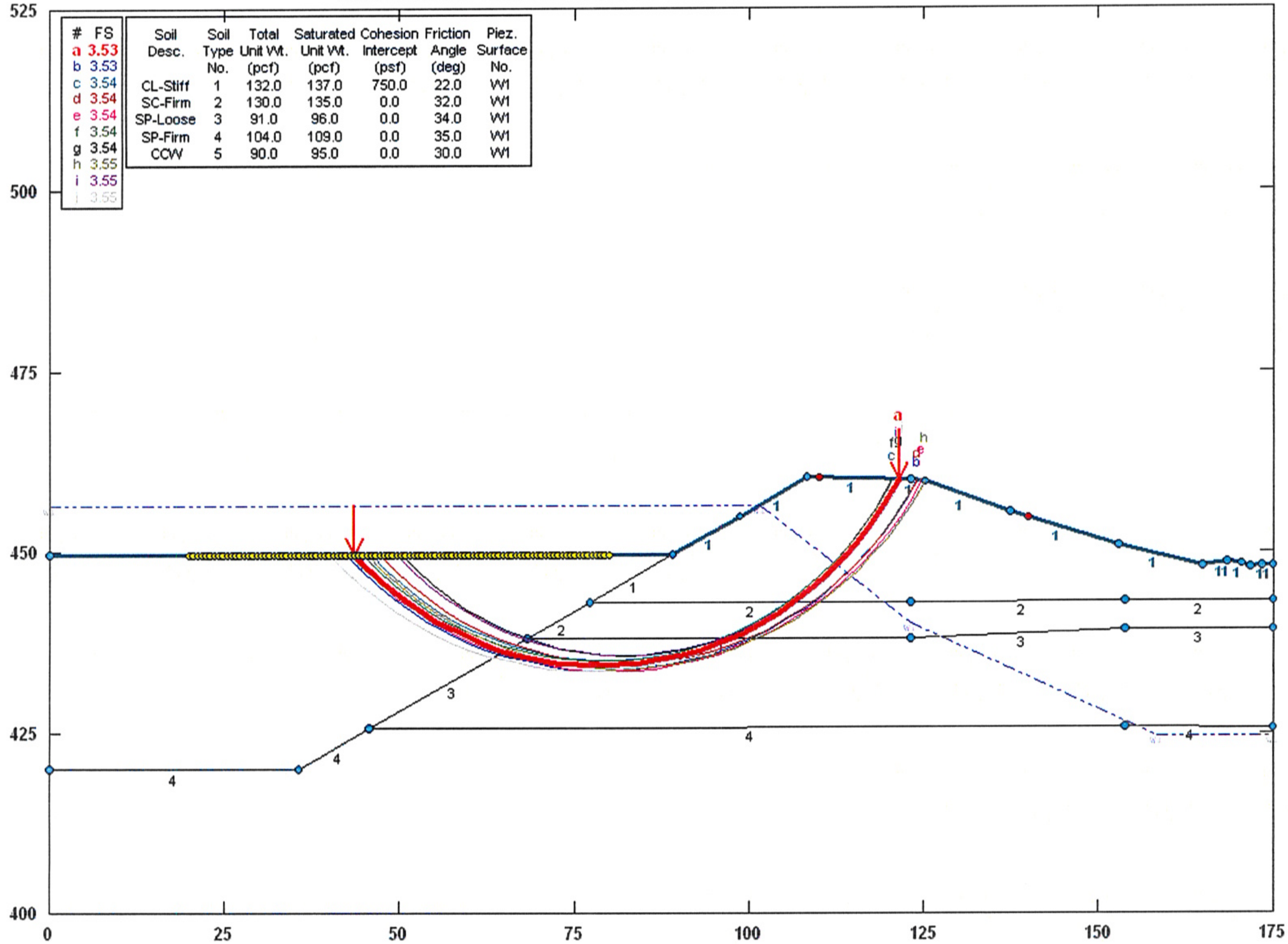
STABL6H FSmin=3.90

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 5, Upstream, Steady-State

C:\STEDWIN\CANERU~1\S5\UPSTREAM\5_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 4:20PM



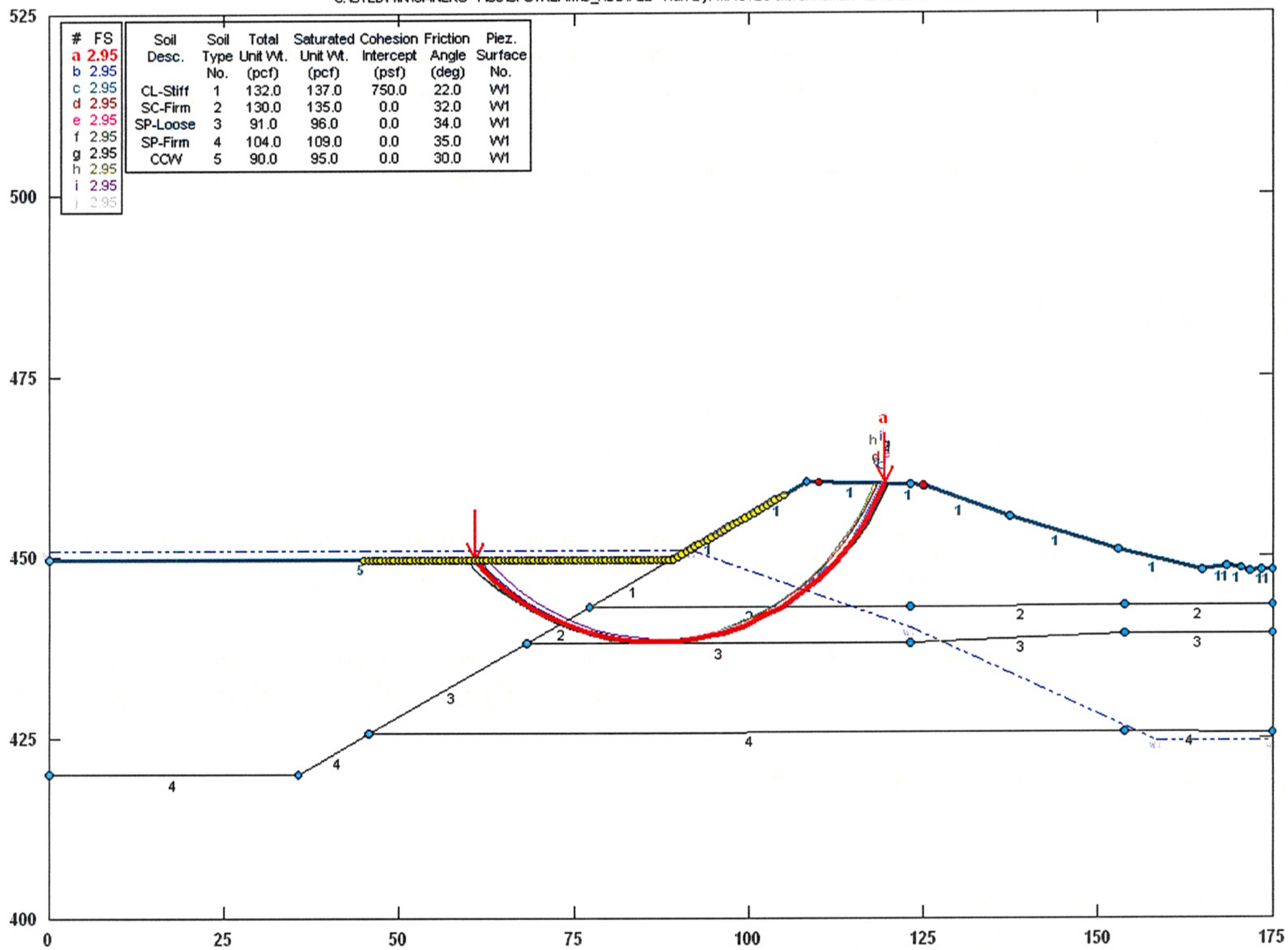
STABL6H FSmin=3.53

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 5, Upstream, Rapid Drawdown

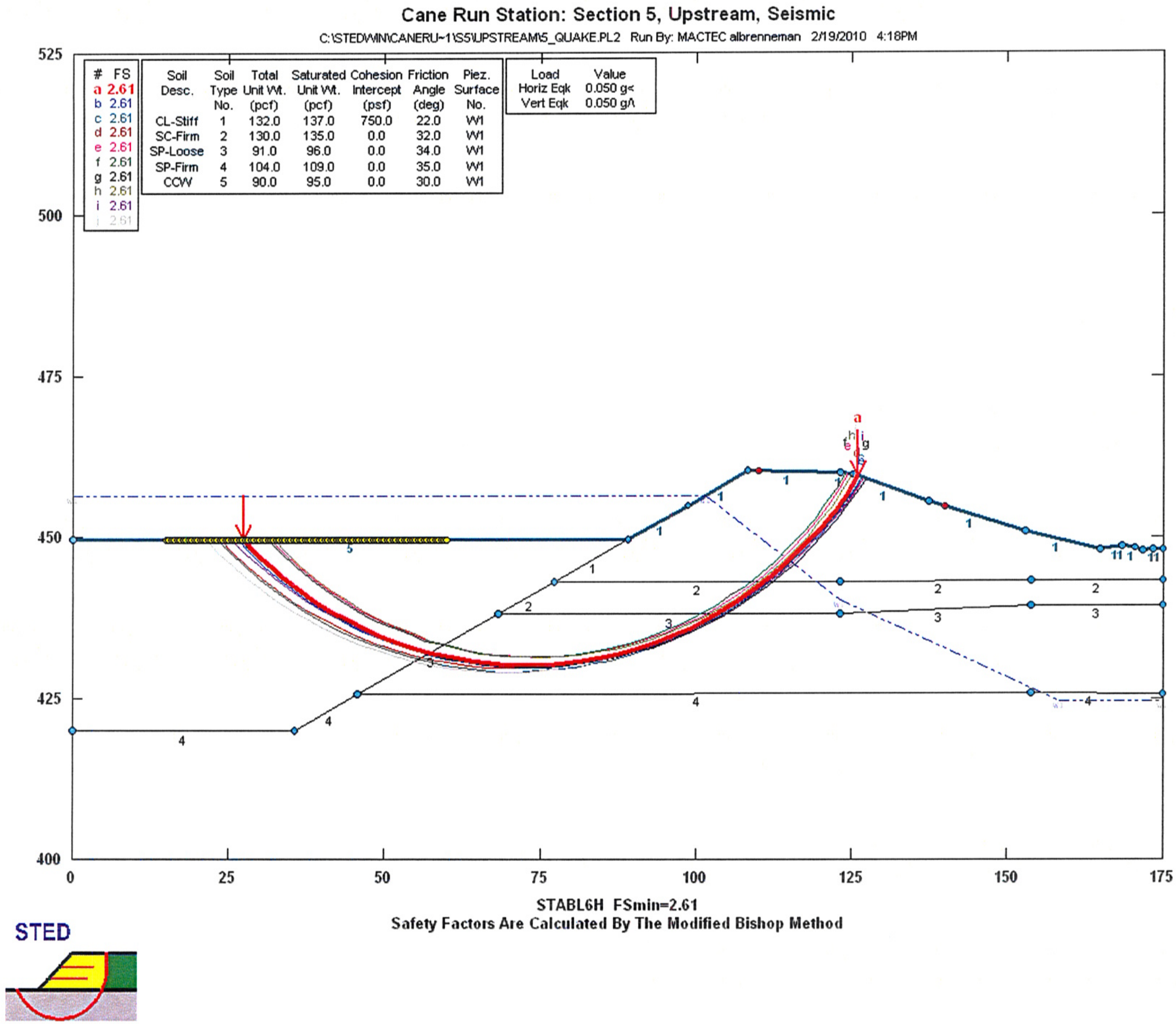
C:\STEDWIN\CANERU~1\S5\UPSTREAM\5_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 4:16PM



STABL6H FSmin=2.95

Safety Factors Are Calculated By The Modified Bishop Method

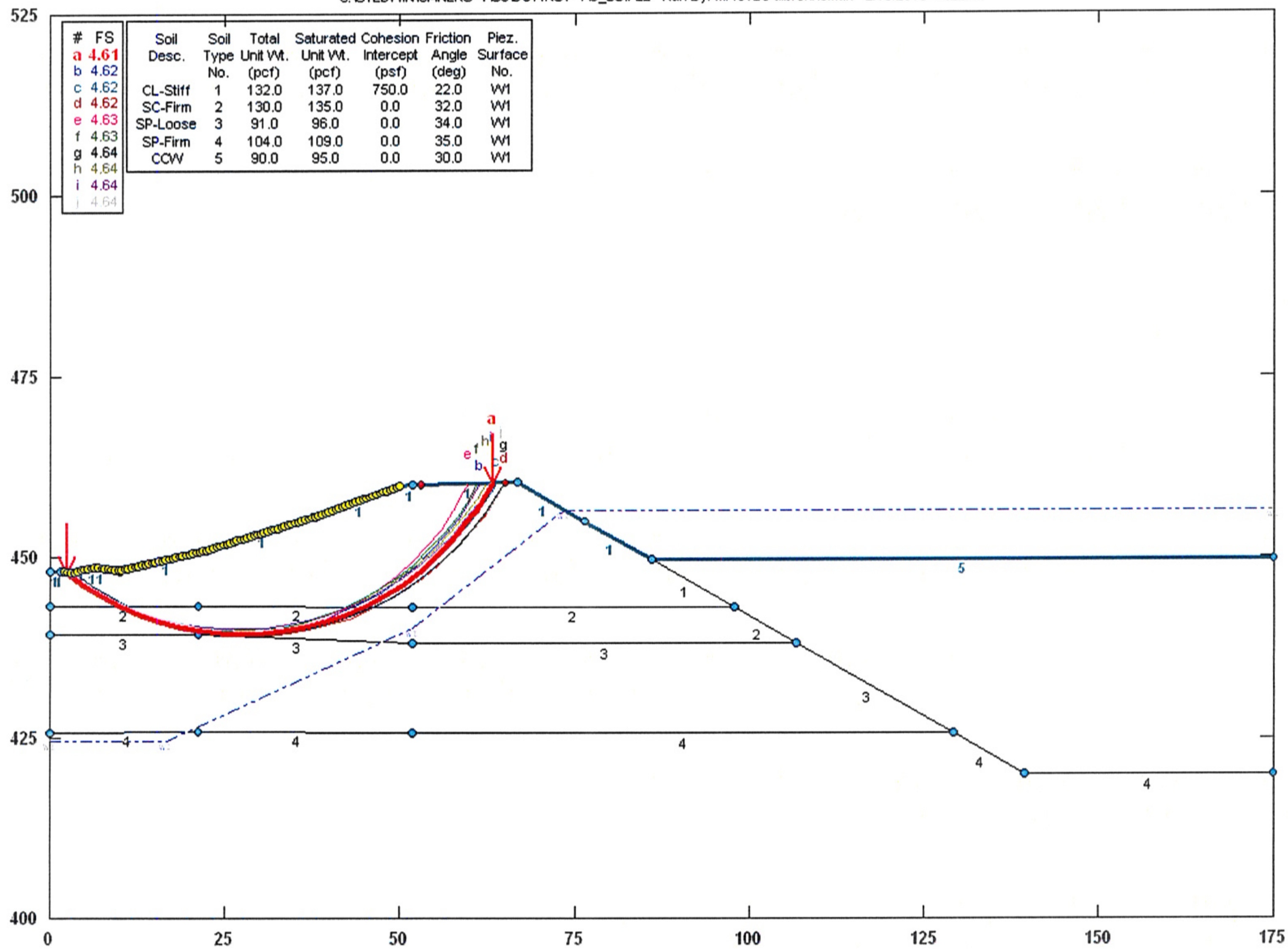
STED



Cane Run Station: Section 5, Upstream, Seismic
C:\STEDWIN\CANERU~1\S5\UPSTREAM\5_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 4:18PM
FS
a 2.61
b 2.61
c 2.61
d 2.61
e 2.61
f 2.61
g 2.61
h 2.61
i 2.61
j 2.61
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No.
CL-Stiff 1 132.0 137.0 750.0 22.0 W1
SC-Firm 2 130.0 135.0 0.0 32.0 W1
SP-Loose 3 91.0 96.0 0.0 34.0 W1
SP-Firm 4 104.0 109.0 0.0 35.0 W1
CCW 5 90.0 95.0 0.0 30.0 W1
Load Value
Horiz Eqk 0.050 g<
Vert Eqk 0.050 g/\
525
500
475
450
425
400
0
25
50
75
100
125
150
175
STABL6H FSmin=2.61
Safety Factors Are Calculated By The Modified Bishop Method
STED

Cane Run Station: Section 5, Downstream, Steady-State

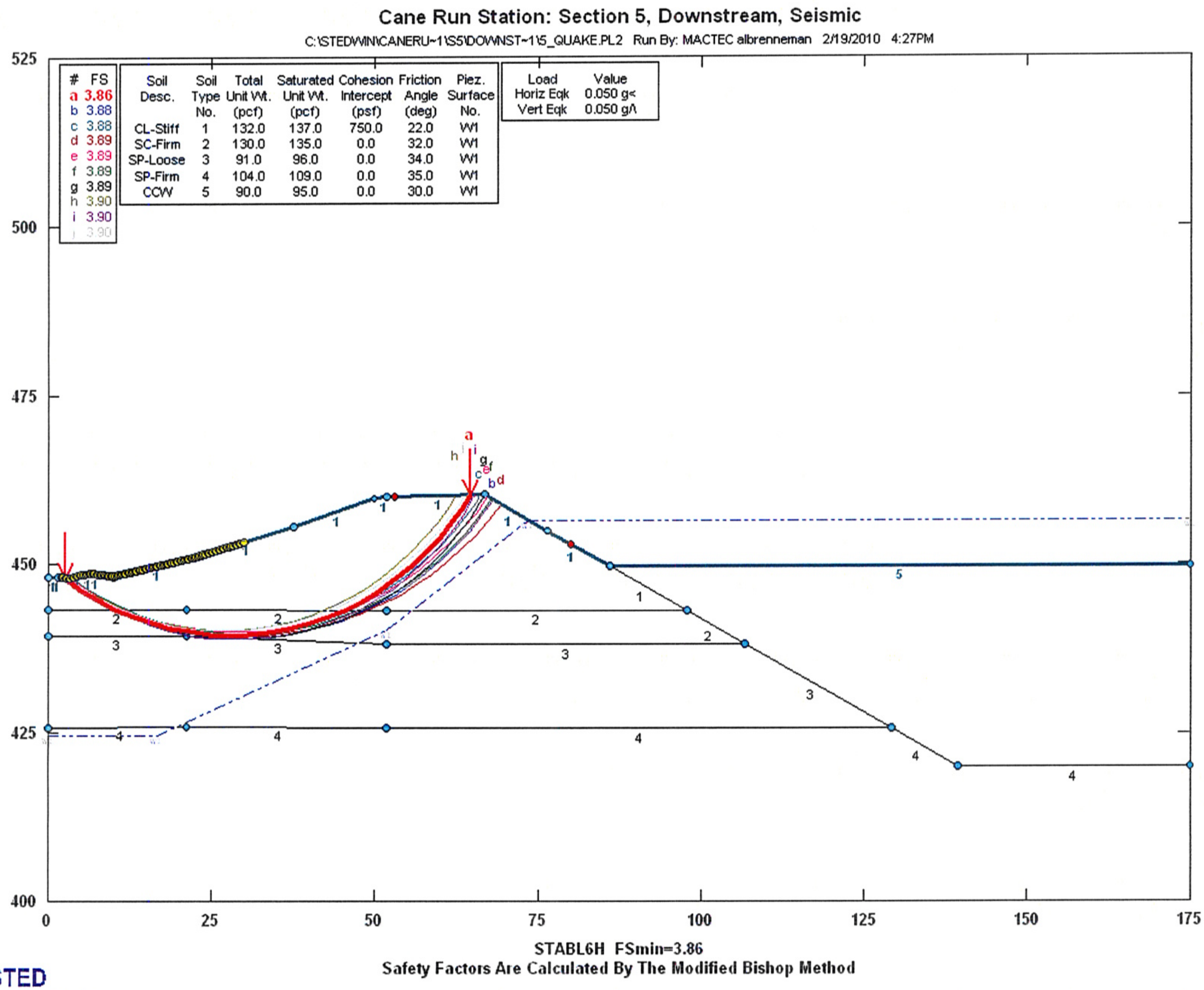
C:\STEDWIN\CANERU~1\S5\DOWNST~1\5_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 4:22PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
SC-Firm	2	130.0	135.0	0.0	32.0	W1
SP-Loose	3	91.0	96.0	0.0	34.0	W1
SP-Firm	4	104.0	109.0	0.0	35.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

STABL6H FSmin=4.61
Safety Factors Are Calculated By The Modified Bishop Method

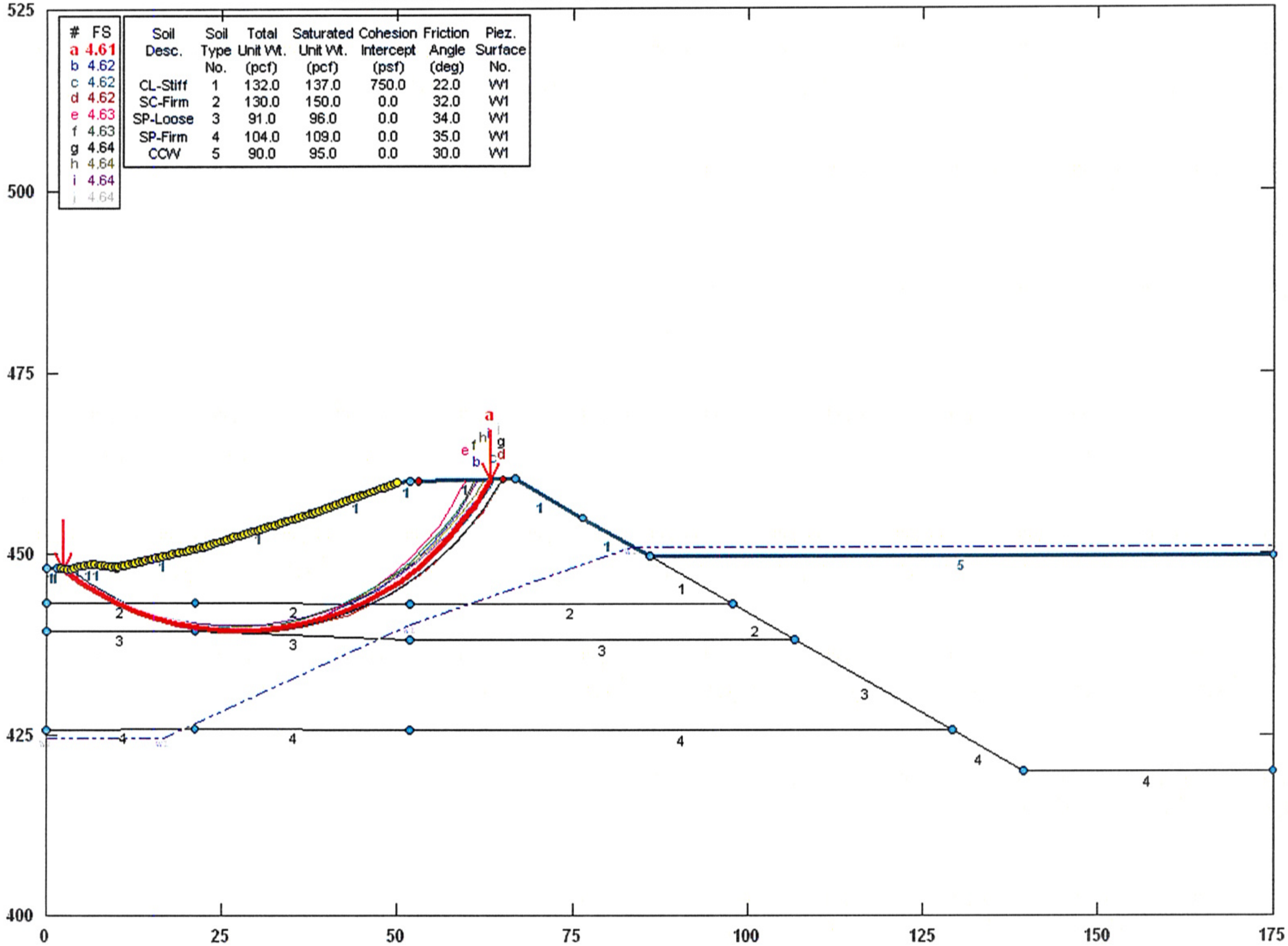
STED


Cane Run Station: Section 5, Downstream, Seismic
C:\STEDWIN\CANERU~1\S5\DOWNST~1\5_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 4:27PM
FS
a 3.86
b 3.88
c 3.88
d 3.89
e 3.89
f 3.89
g 3.89
h 3.90
i 3.90
j 3.90
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No.
CL-Stiff 1 132.0 137.0 750.0 22.0 W1
SC-Firm 2 130.0 135.0 0.0 32.0 W1
SP-Loose 3 91.0 96.0 0.0 34.0 W1
SP-Firm 4 104.0 109.0 0.0 35.0 W1
CCW 5 90.0 95.0 0.0 30.0 W1
Load Value
Horiz Eqk 0.050 g<
Vert Eqk 0.050 g/\
525
500
475
450
425
400
0
25
50
75
100
125
150
175
STABL6H FSmin=3.86
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 5, Downstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S5\DOWNST~1\5_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 4:23PM



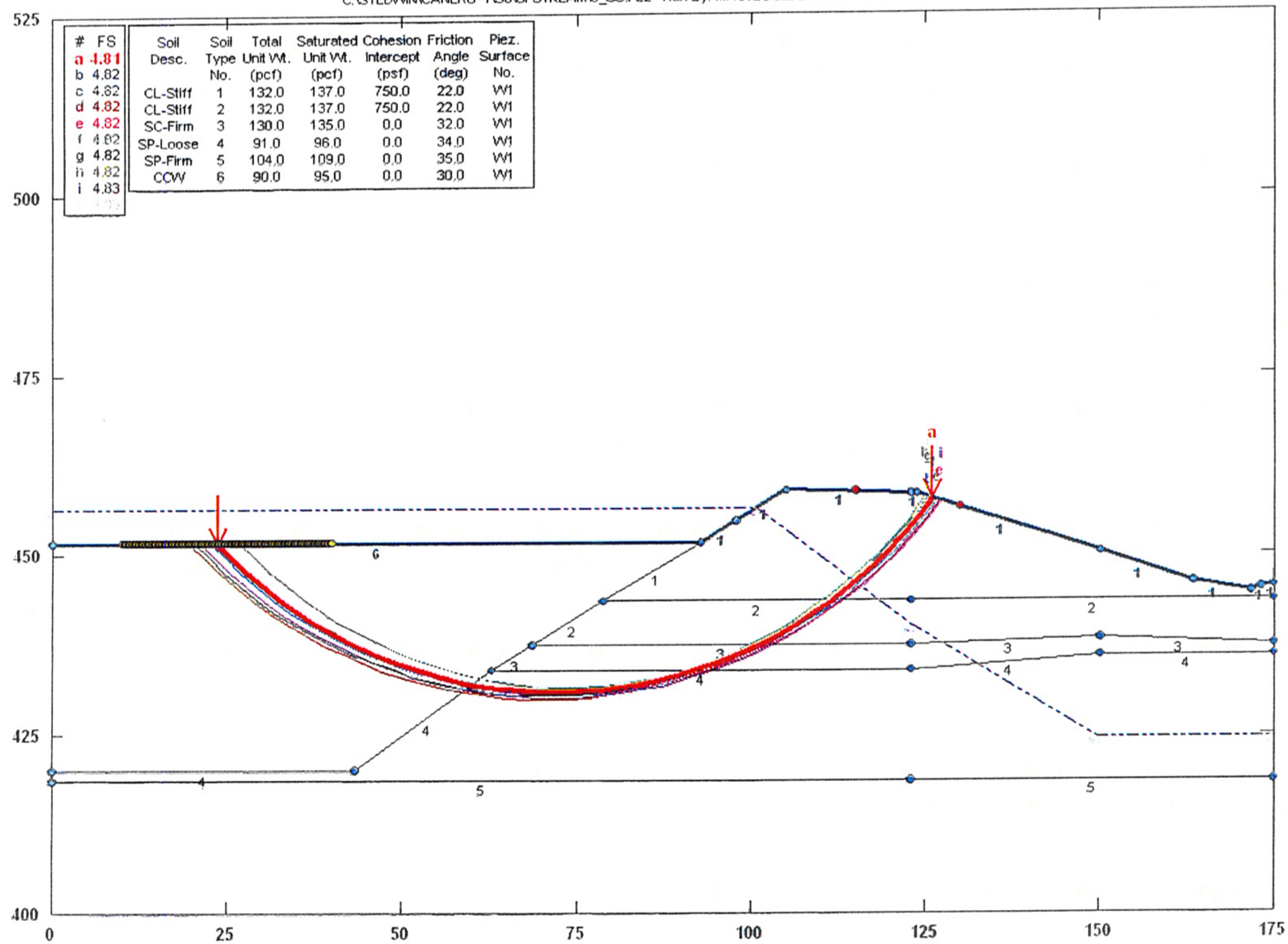
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
SC-Firm	2	130.0	150.0	0.0	32.0	W1
SP-Loose	3	91.0	96.0	0.0	34.0	W1
SP-Firm	4	104.0	109.0	0.0	35.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

STABL6H FSmin=4.61
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 6, Upstream, Steady-State

C:\STEDWIN\CANERU~1\S6\UPSTREAM\6_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 4:35PM



STABL6H FSmin=4.81

Safety Factors Are Calculated By The Modified Bishop Method

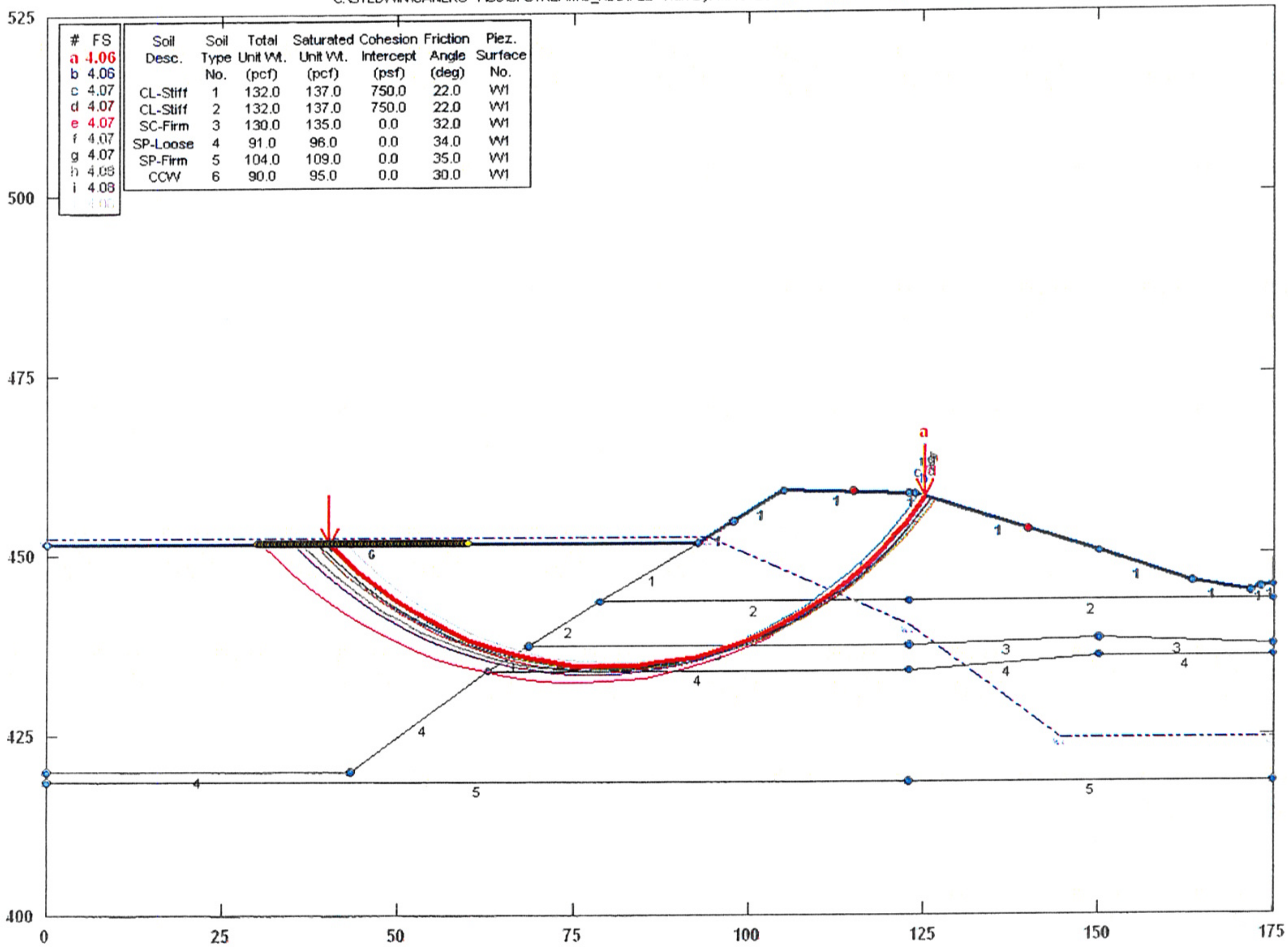
STED

Cane Run Station: Section 6, Upstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S6\UPSTREAM\6_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 4:38PM

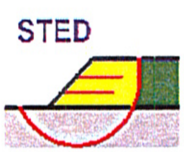
#	FS
a	4.06
b	4.06
c	4.07
d	4.07
e	4.07
f	4.07
g	4.07
h	4.08
i	4.08

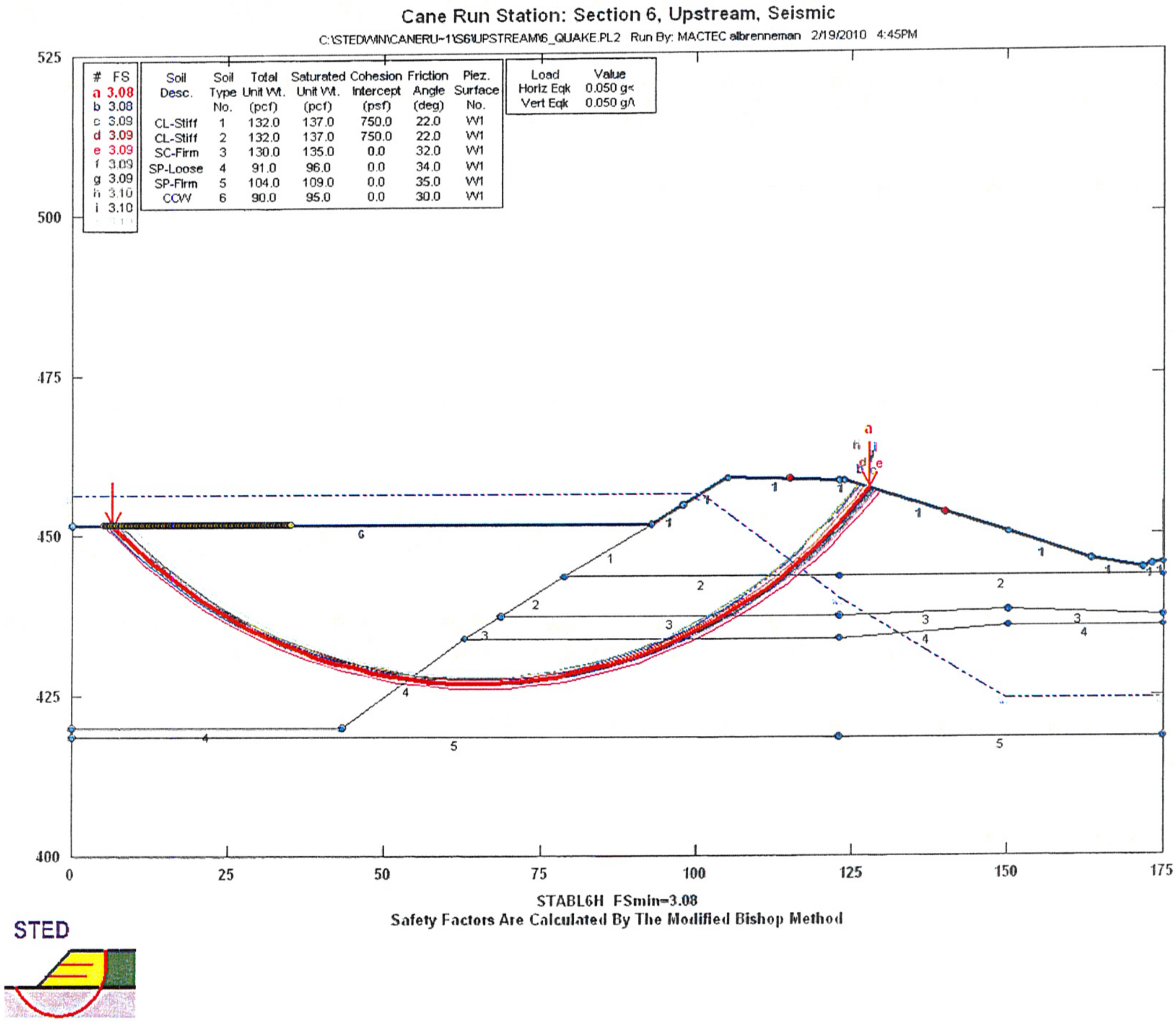
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Stiff	2	132.0	137.0	750.0	22.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
SP-Firm	5	104.0	109.0	0.0	35.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1



STABL6H FSmin=4.06

Safety Factors Are Calculated By The Modified Bishop Method

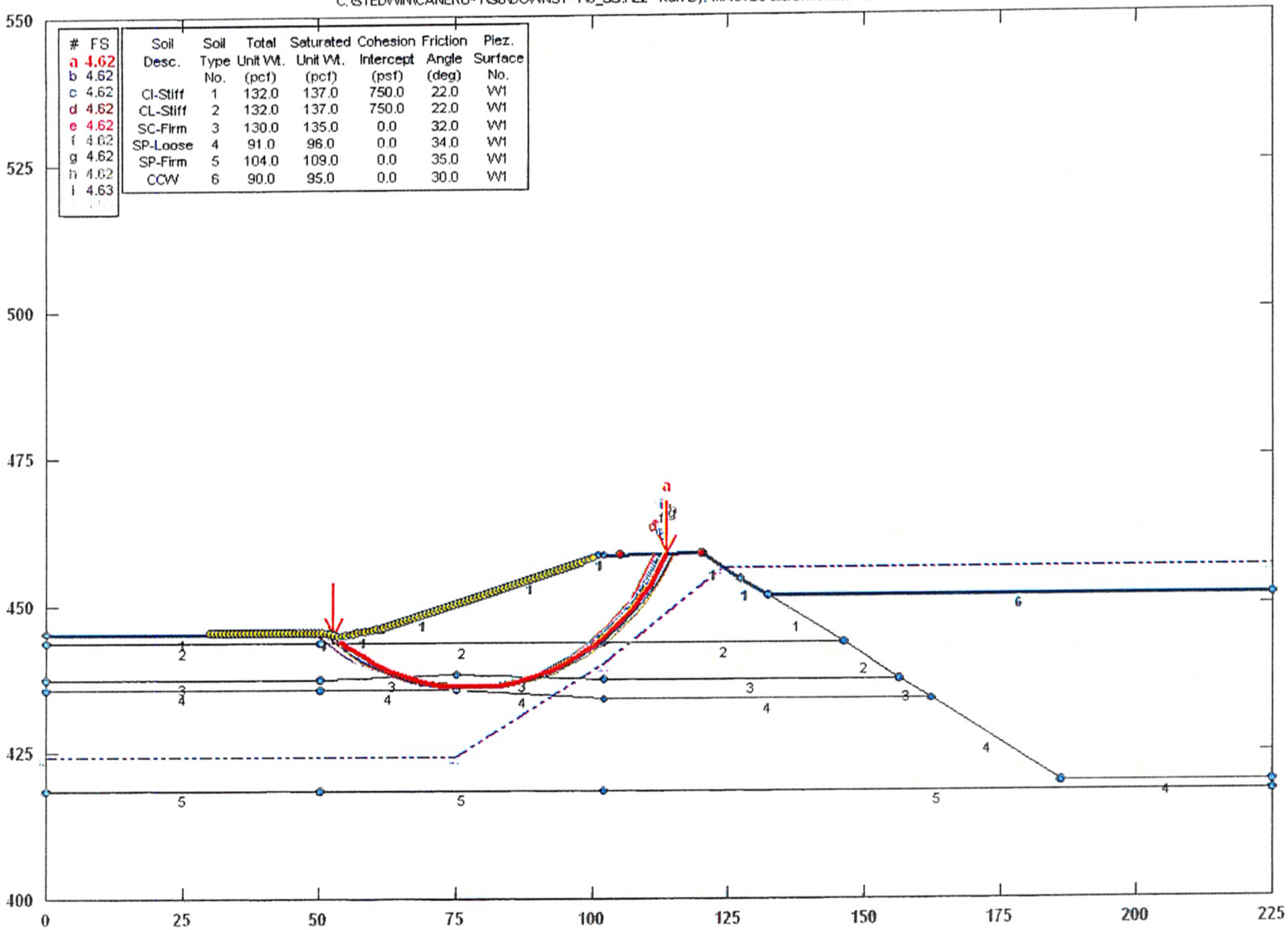




Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Stiff	2	132.0	137.0	750.0	22.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
SP-Firm	5	104.0	109.0	0.0	35.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1

Cane Run Station: Section 6, Downstream, Steady-State

C:\STEDWIN\CANERU~1\S6\DOWNST~1\6_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 4:40PM



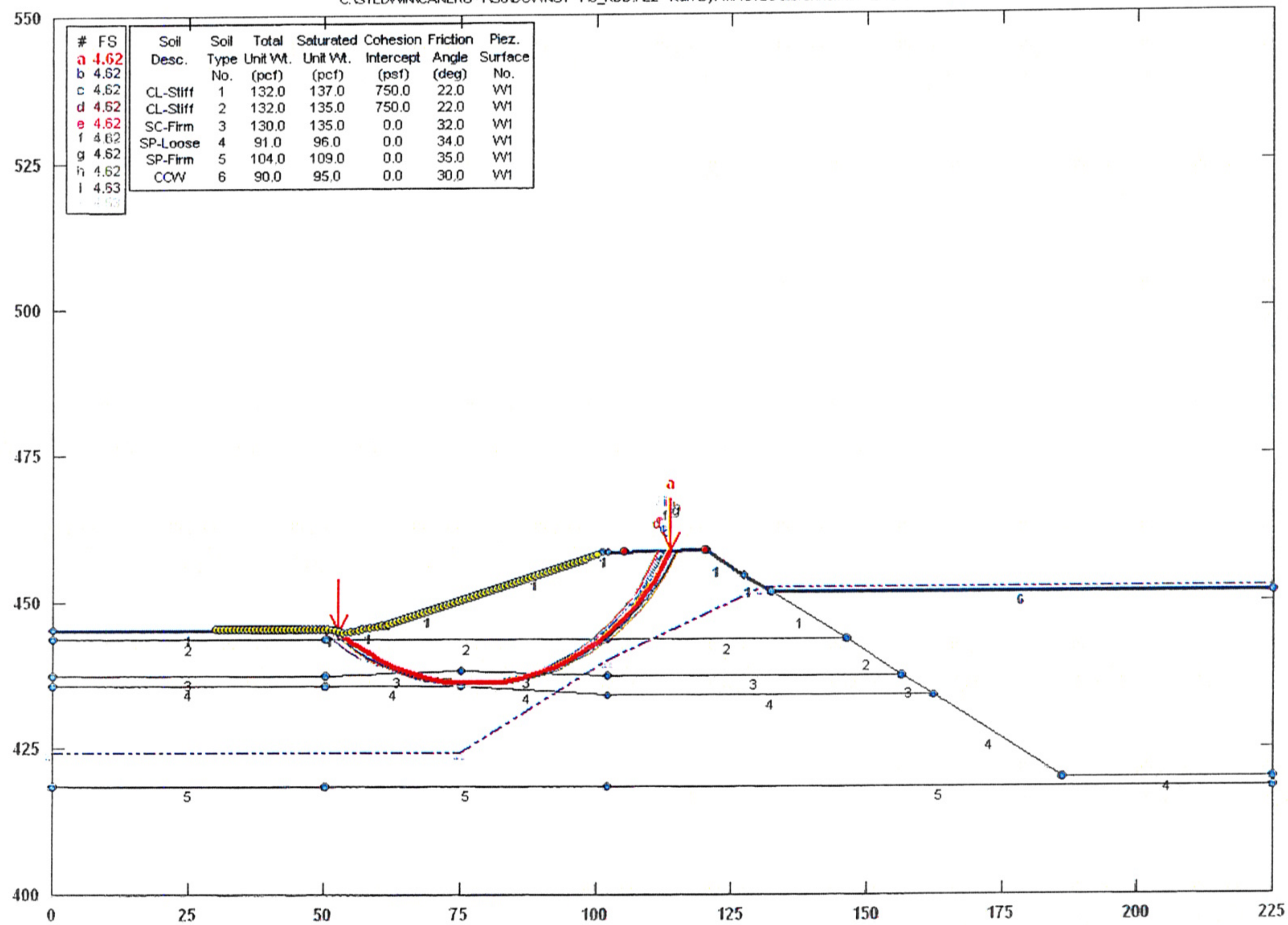
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Cl-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Stiff	2	132.0	137.0	750.0	22.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
SP-Firm	5	104.0	109.0	0.0	35.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1

STABL6H FSmin=4.62
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 6, Downstream, Rapid Drawdown

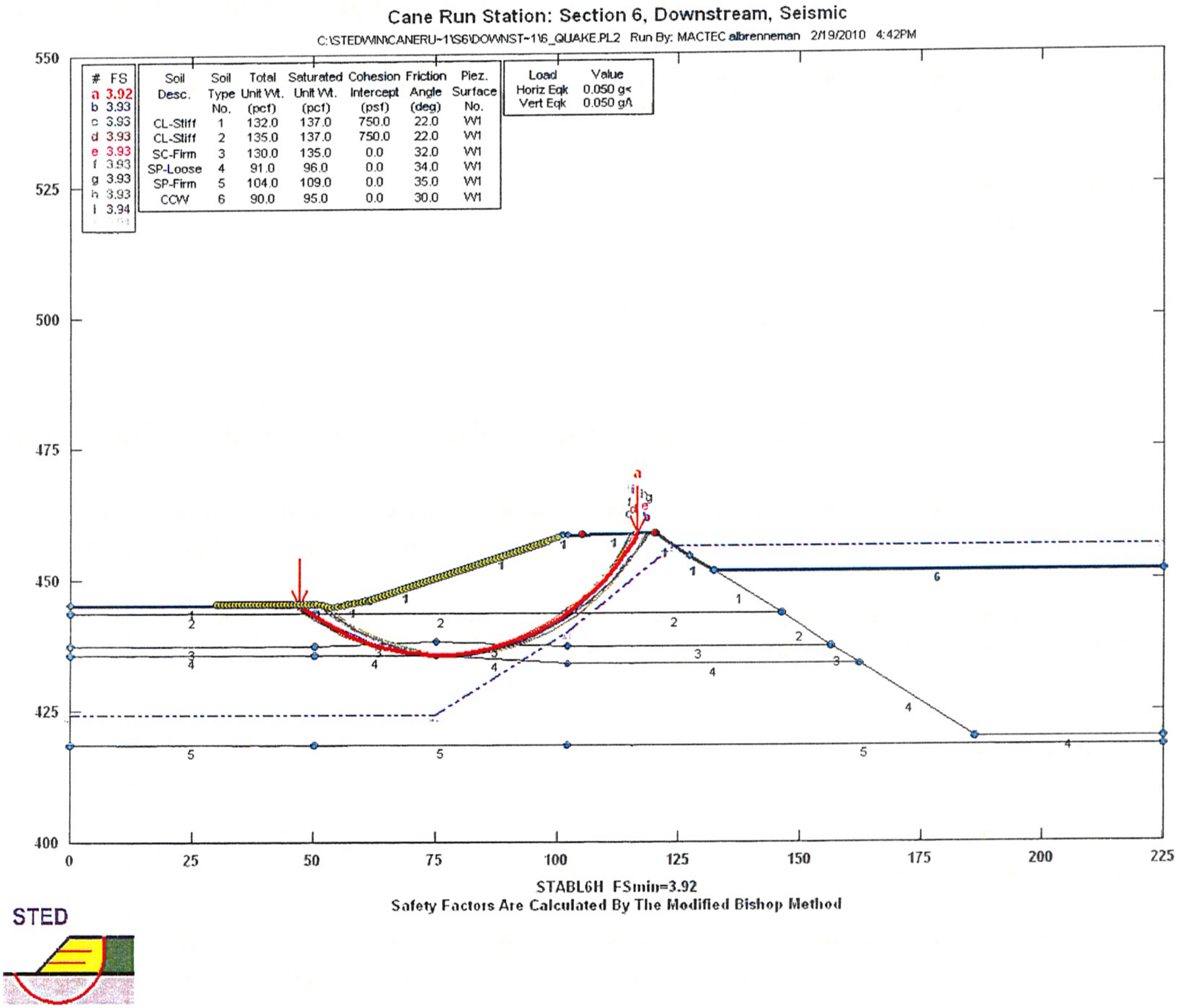
C:\STEDWIN\CANERU~1\S6\DOWNST~1\6_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 4:41PM



STABL6H FSmin=4.62

Safety Factors Are Calculated By The Modified Bishop Method

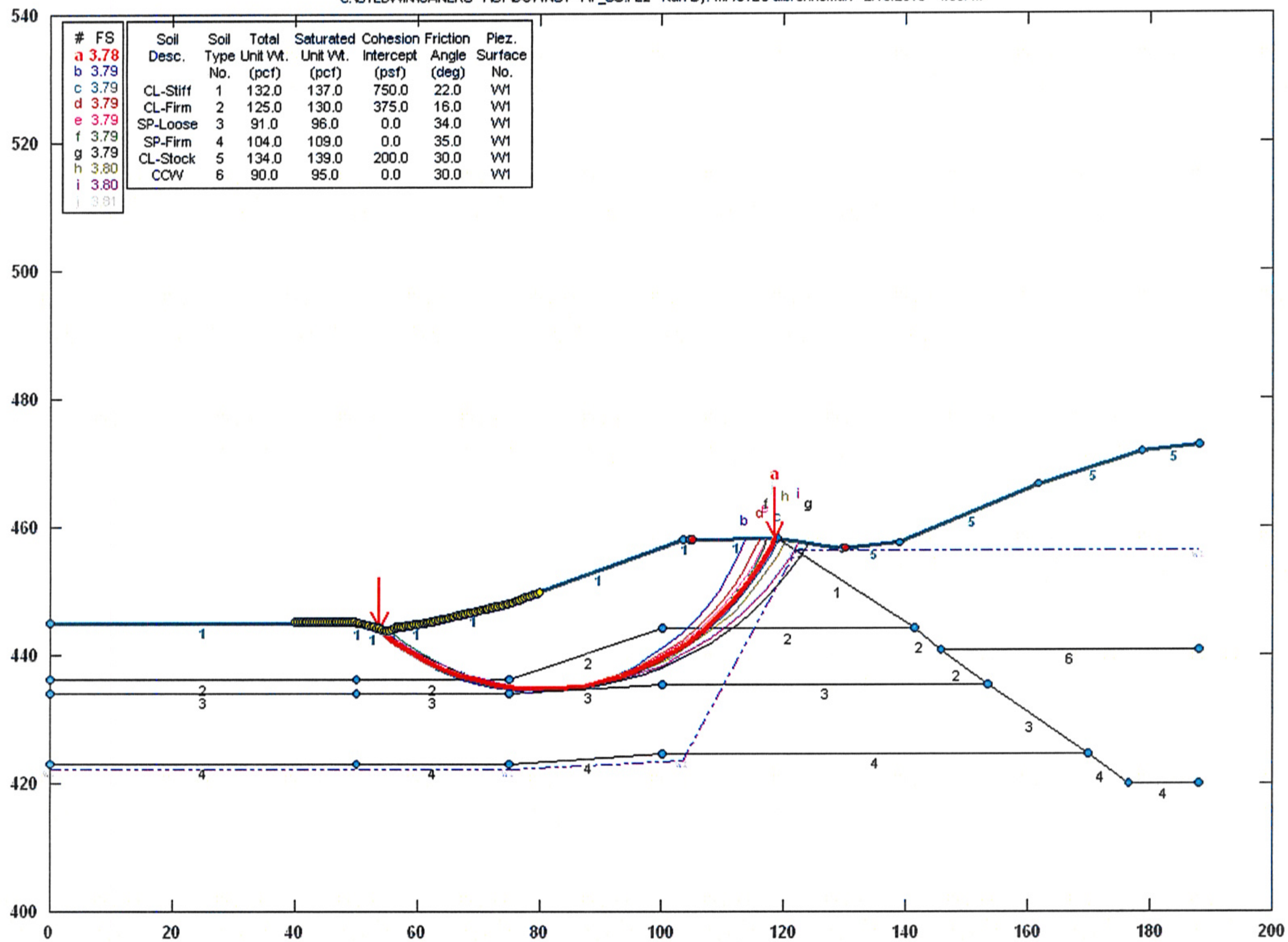
STED



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Stiff	2	135.0	137.0	750.0	22.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
SP-Firm	5	104.0	109.0	0.0	35.0	W1
CCW	6	90.0	95.0	0.0	30.0	W1

Cane Run Station: Section 7, Downstream, Steady-State

C:\STEDWIN\CANERU~1\S7\DOWNST~1\7_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 4:56PM

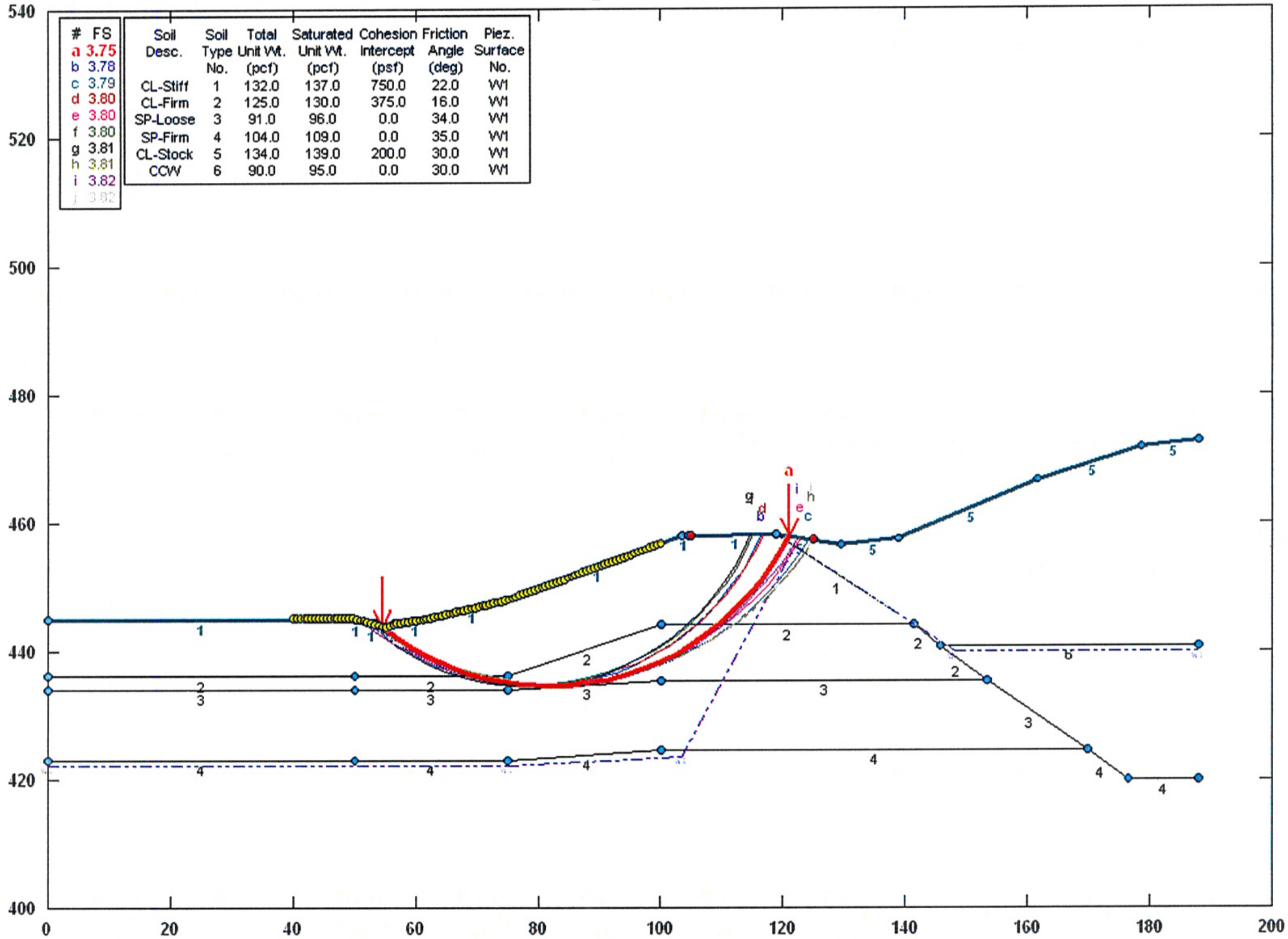


STABL6H FSmin=3.78
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 7, Downstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S7\DOWNST~1\7_RDD.PL2 Run By: MACTEC albrenneman 2/19/2010 4:54PM

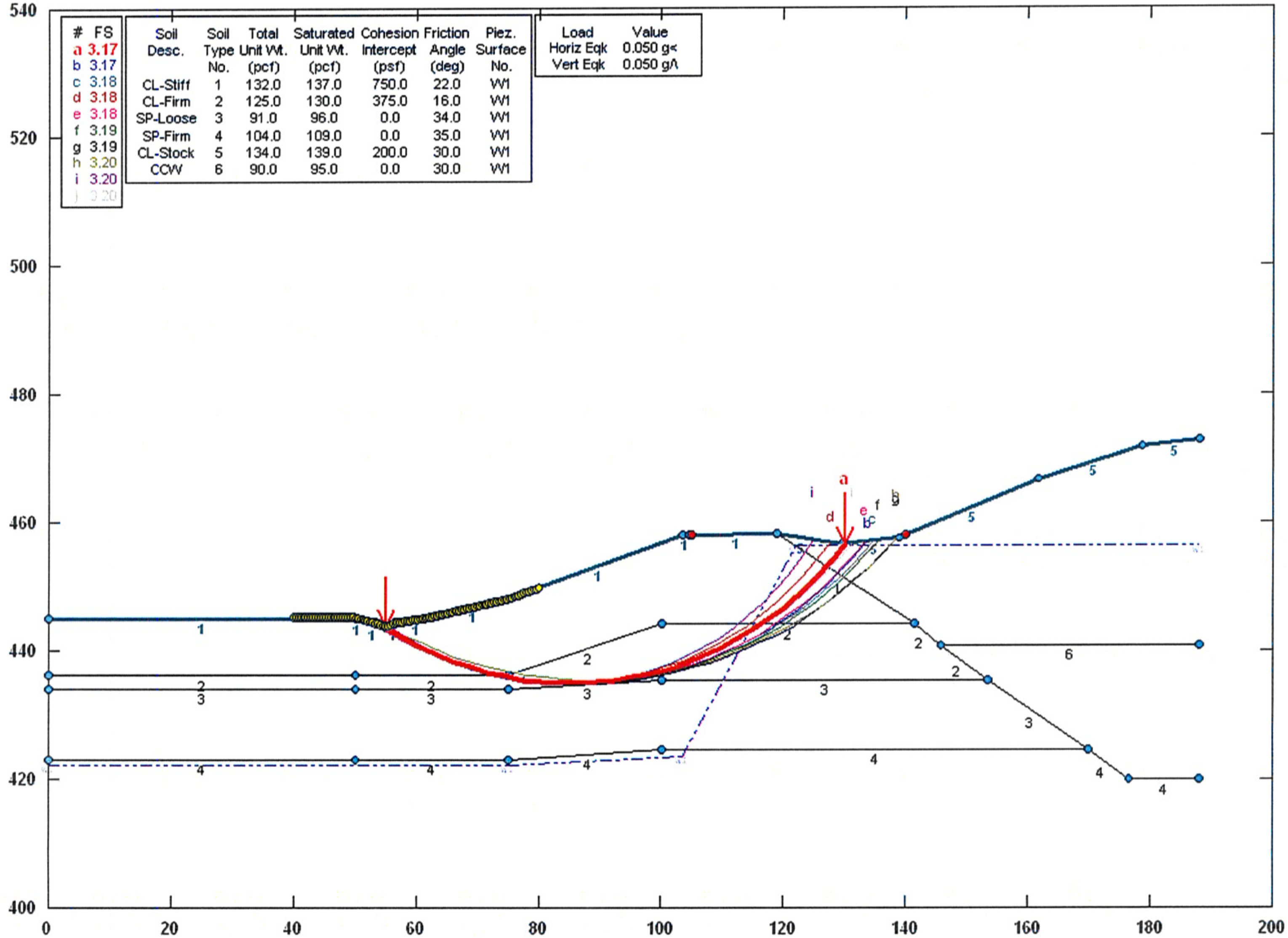


STABL6H FSmin=3.75
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 7, Downstream, Seismic

C:\STEDWIN\CANERU~1\S7\DOWNST~1\7_QUAKE.PL2 Run By: MACTEC albrenneman 2/19/2010 4:58PM



STABL6H FSmin=3.17

Safety Factors Are Calculated By The Modified Bishop Method

STED

Attachment 3 – LG&E Additional Information

Geotechnical Exploration and Slope Stability Analyses, Data Package

Louisville Gas and Electric (LG&E)

Cane Run Station

Dead Storage Pond /Basin Pond Complex,

MACTEC Engineering and Consulting,

February 23, 2010

GEOTECHNICAL EXPLORATION AND SLOPE STABILITY ANALYSES DATA PACKAGE

LOUISVILLE GAS AND ELECTRIC (LG&E)
CANE RUN STATION
DEAD STORAGE POND / BASIN POND COMPLEX
LOUISVILLE, KENTUCKY

February 23, 2010

Prepared For:

E. ON U.S. Services, Inc.
220 West Main Street
Louisville, Kentucky 40202

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC.
13425 Eastpointe Centre Drive, Suite 122
Louisville, Kentucky 40222

MACTEC PROJECT 3143-10-1216

MACTEC

MACTEC

engineering and constructing a better tomorrow

February 23, 2010

Mr. David J. Millay, P.E.
E. ON U.S. Services, Inc.
220 West Main Street
Louisville, Kentucky 40202
Phone: 502-627-2468
Facsimile: 502-217-2850
Electronic mail: David.Millay@eon-us.com

SUBJECT: Geotechnical Exploration and Slope Stability Analyses Data Package
LG&E Cane Run Station – Dead Storage Pond / Basin Pond Complex
Louisville, Jefferson County, Kentucky
MACTEC Project Number 3143-10-1216

Dear Mr. Millay:

MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit this data package summarizing our geotechnical exploration and slope stability analyses completed to date for the Dead Storage Pond / Basin Pond Complex at the LG&E Cane Run Station Facility in Louisville, Jefferson County, Kentucky. Our services were provided in general accordance with our Master Agreement Number 31528, Contract Number 41994 and our Proposal Number PROP10LVLE Task 006R, dated February 4, 2010.

The attached data package presents a brief discussion of our scope of geotechnical services, results of our field and laboratory testing and the results of our slope stability analyses performed to date. A final report of our geotechnical exploration and slope stability analyses for this facility will be issued under separate cover.

MACTEC appreciates this opportunity to provide our services to you and we look forward to serving as your geotechnical consultant throughout this project. Please contact us if you have any questions regarding the information presented.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

April L. Brenneman, P.E.
Project Engineer
Licensed Kentucky 26750

Nicholas G. Schmitt, P.E.
Senior Principal Engineer
Licensed Kentucky 10311

Attachment: Data Package

EXECUTIVE SUMMARY

The firm of CHA was contracted by Lockheed Martin (a contractor of the United States Environmental Protection Agency) to perform a site assessment of the coal combustion waste (CCW) impoundments at the Louisville Gas and Electric (LG&E) Cane Run Station Facility. CHA issued a *Draft Report of Assessment of Dam Safety*, for these facilities on December 18, 2009. LG&E retained MACTEC to provide geotechnical engineering consulting services and to conduct geotechnical explorations and slope stability analyses on the Ash Treatment Basin (ATB)/Emergency Pond (E-Pond) Complex and the Dead Storage/Basin Pond Complex. This document presents a high level summary of our activities, findings and conclusions to date, for the Basin Pond/Dead Storage Pond Complex. The ATB/E-Pond Complex activities are reported under separate cover.

Background

The Dead Storage Pond/Basin Pond Complex consists of two ponds separated by a common divider dike with a combined surface area of approximately 6 acres. The 2 acre Basin Pond is located on the south side of the common dike and the 4 acre Dead Storage Pond is located on the north side of the divider dike. According to CHA, the Dead Storage Pond contains unused carbide-lime slurry and receives run-off from the portable lime slakers and lime receiving areas. Excess water flows into the Basin Pond, in addition to equipment wash-down run-off flows. Solid materials in the Basin Pond include calcium sulfites and fly ash used in scrubber sludge.

The Dead Storage Pond/Basin Pond Complex is partially incised and partially diked, with approximately 1,100 linear feet diked on the north and east sides and the remainder (south and west sides) are fully incised. The crest elevation ranges from 450 to 453 feet National Geodetic Vertical Datum of 1929 (NGVD), with a typical crest width of approximately 20 feet on the east side and 40 feet on the north side. The bottom of pond elevation is 430 feet NGVD. The downstream toe elevation is approximately 441 feet NGVD, resulting in a maximum dam height of approximately 12 feet. The pool elevation at the time of our exploration was approximately 440 feet NGVD.

Engineering Approach

MACTEC's engineering approach is based on 1) a systematic process of obtaining and reviewing available data; 2) developing an exploration approach to efficiently obtain missing data that is required to evaluate the stability of the structure and 3) assigning a project team with all the requisite technical skills and experience necessary to fully evaluate the existing impoundment conditions, competency and stability.

MACTEC assembled a geotechnical engineering team that met with LG&E representatives to outline our engineering approach and geotechnical exploration. We reviewed the *Draft Report of Assessment of Dam Safety,* reviewed aerial photographs, reviewed Kentucky Division of Water inspection reports and conducted a site reconnaissance.

MACTEC developed a geotechnical exploratory drilling program, a geotechnical laboratory testing program and determined supplemental surveying requirements. The primary guidance documents for the development of our exploration and analyses included: Kentucky Environment and Energy Cabinet, Water Infrastructure Branch, Dam Safety Division Guidelines (primarily Engineering Memorandum Number 5 and KAR 401:030 – Design Criteria for Dams and Associated Structures and "Guidelines for Geotechnical Investigation and Analysis of New and Existing Earth Dams") and the U.S. Army Corps of Engineers Engineering Manual (USACE) EM 1110-2-1902. These guidance documents suggest a Factor of Safety (FOS) of 1.5 for long-term, steady-state conditions using maximum storage pool (EM 1110-2-1902 suggests an FOS of 1.4 for long-term, steady-state conditions using maximum surcharge pool); an FOS of 1.2 for rapid drawdown (EM 1110-2-1902 suggests an FOS in the range of 1.1-1.3); and an FOS of 1.0 for seismic conditions.

Exploration and Laboratory Testing Program

The geotechnical exploration program was developed to obtain subsurface data at three cross-sections along the dam at areas we judged to be "critical" based on the topography and nature of the exposed slope. A total of three soil test borings were drilled along the embankment crest, extending to depths of 50 feet, and a total three soil test borings were drilled along the toe of the embankment to depths up to 25 feet. A total of two piezometers were installed along the embankment crest and one piezometer was installed in a toe boring to monitor pieziometric levels within the dam.

The geotechnical laboratory testing program consisted of extensive classification tests, including Atterberg Limits, Grain-size analyses and specific gravity determinations; and strength tests including consolidated undrained triaxial shear tests with pore pressure monitoring and direct shear tests, to determine both total stress and effective stress parameters. In addition to this laboratory testing program, the Standard Penetration Test results obtained during drilling were statistically analyzed to delineate the general subsurface conditions.

Slope Stability Modeling and Analyses

Slope stability analyses were conducted using the computer program PCSTABL, developed by Purdue University. The program uses a two-dimensional limit equilibrium method of analysis and calculates the factor of safety based on the Modified Bishop Method of Slices. Our analyses were performed to model the overall stability of the existing dike including steady-state, flooding, rapid drawdown and seismic (dynamic) conditions. To date, one cross-section (Section 11) located along the north dike has been analyzed, the location of which is shown on the attached Boring Location Plan and Stability Section drawing. A total of three cross-sections will be analyzed for the Dead Storage Pond / Basin Pond Complex. The results of the remaining analyses to be performed will be submitted in our final report of geotechnical exploration and slope stability analyses.

The geometry used in the analyses of the Dead Storage/Basin Pond Complex was based on a topographic survey of the boring locations and cross-sections provided by HDR in January 2010.

For Section 11, the downstream slope face ranged from 1.7H:1V to 2.8H:1V (horizontal to vertical) and the upstream slope (wet side) range from 0.7H:1V to 2.5H:1V. The steepest slopes were observed to be nearest the crest on both the upstream and downstream faces. The upstream slopes below the current water or ash levels were projected from the topographic data obtained in the field at each cross-section location from the portion of the upstream slope above the water/CCW level.

In general, the dike was constructed of clay and sand fill reportedly to be excavated from the incised portion of the pond. The fill was placed overlying existing alluvial soils comprised of clay overlying sandy soils. Soil parameters (shown in Table 1 below) selected for the slope stability analyses were chosen based on various resources including the results of the extensive laboratory testing described above, field testing and observations, published information on similar soil types and our experience. The soil strength parameters selected for each cross-section analyzed are shown on the PCSTABL plots submitted with this data package.

Table 1. Soil Parameters

Soil Type No.	Soil Description	Unit Weight		Effective Stress	
		Total (pcf)	Saturated (pcf)	Cohesion C' (psf)	Friction Angle Φ' (degrees)
1	CL (stiff)	125	130	500	22
2	SM (loose)	120	125	100	31
3	SP (loose)	91	96	0	34
4	SW-SM (Firm)	108	113	0	35

Calculated By: *ALB*
Checked By: *CRV*

Seismic conditions for this site were modeled under dynamic loading conditions using a peak ground acceleration value of 0.050g (horizontally and vertically) for a 2 percent probability of exceedance in 50 years.

The normal operating pool for the Dead Storage/Basin Pond Complex ranges from 440 to 445 feet NGVD. The maximum surcharge pool (crest of dam) was used in our analyses (ranging from 449.8 to 453.0 feet NGVD). The unit weight of water contained within the pond was modeled as 62.4 pounds per cubic foot (pcf). Further, we used water level readings obtained from the piezometers installed in the crest and toe borings and modeled piezometric surfaces that extended across the pond through the embankments to simulate a "worst case" condition. Water levels in the installed piezometers are shown on the attached boring logs.

Conclusions and Recommendations

The results of the analyses for the critical cross-section selected (Section 11) are summarized in the Factor of Safety (FOS) Summary Table included as an attachment to this data package. In addition, the PCSTABL Plots showing the models and failure circles are also attached. Based on the guidance documents previously referenced, a slope stability target FOS for dam embankments of 1.5 is recommended for long-term, steady-state (effective stress) stability; an FOS of 1.4 is recommended for maximum surcharge pool (effective stress) conditions; an FOS of 1.2 is recommended for rapid drawdown (effective stress) conditions and an FOS of 1.0 is recommended for seismic (dynamic) loading (effective stress) conditions. Our analyses, performed using the parameters and geometry described above, indicates that the cross-section analyzed to date provides acceptable factors of safety according to the criteria described herein.

MACTEC has completed laboratory analyses on selected material collected during the field exploration. Based on our initial review of the data, the material properties, and embankment characteristics, it is expected that further analysis will result in factors of safety the meet regulatory guidelines. We will continue slope stability analyses efforts for the Dead Storage/Basin Pond Complex and will revise analyses and identify critical cross-sections as necessary. The results of these engineering analyses and a detailed report of our geotechnical exploration will be provided in our final report.

SITE LOCATION MAP

SOURCE: CaneRunA.tif, based on Aerial Survey performed by L. Robert Kimball Associates on December 21, 2009

LOUISVILLE GAS & ELECTRIC 220 WEST MAIN STREET LOUISVILLE, KENTUCKY PROJECT NO. 3143-10-1216	MACTEC 13425 Eastpoint Centre Drive, Ste 122 Louisville, KY. 40223 Phone: 502-253-2500 Fax: 502-253-2501 CHECKED BY: A.BRENNEMAN PREPARED BY: G.HAYS	SITE LOCATION MAP LG&E CANE RUN POWER STATION LOUISVILLE, KENTUCKY CADD FILE: 101216_SLM.dwg PLOT DATE: 2/8/10 FIGURE 1

BORING LOCATION PLAN AND SLOPE STABILITY SECTIONS

Source: Louisville/Jefferson County Information Consortium (lojic), Boring Locations and Sections provided by HDR.

REV	DATE	BY	DESCRIPTION

SEAL

DESIGNED	A.BRENNEMAN
DRAWN	G.HAYS
CHECKED	A.BRENNEMAN
IN CHARGE	C.VANCE
DATE	2/17/10

LOUISVILLE GAS & ELECTRIC
220 WEST MAIN STREET
LOUISVILLE, KENTUCKY

MACTEC
13425 Eastpoint Centre Drive, Ste 122
Louisville, KY. 40223
Phone: 502-253-2500 Fax: 502-253-2501

BORING LOCATION PLAN AND
SLOPE STABILITY SECTIONS
DEAD STORAGE/BASIN POND COMPLEX
LG&E CANE RUN POWER STATION
LOUISVILLE, KENTUCKY

SCALE	1"=100'
MACTEC PROJECT NO.	3143-10-1216
DWG. NO.	2
CADD FILE:	101216_BLP.dwg
PLOT DATE:	2/17/10

KEY TO SYMBOLS AND DESCRIPTIONS

LOGS OF BORINGS

STATISTICAL ANALYSIS OF SPT RESISTANCES

MACTEC KEY TO SYMBOLS AND DESCRIPTIONS

Group Symbols	Typical Names
GW	Well graded gravels, gravel - sand mixtures, little or no fines.
GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.
GM	Silty gravels, gravel - sand - silt mixtures.
GC	Clayey gravels, gravel - sand - clay mixtures.
SW	Well graded sands, gravelly sands, little or no fines.
SP	Poorly graded sands or gravelly sands, little or no fines.
SM	Silty sands, sand - silt mixtures
SC	Clayey sands, sand - clay mixtures.
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts and with slight plasticity.
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
OL	Organic silts and organic silty clays of low plasticity.
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
CH	Inorganic clays of high plasticity, fat clays
CL-CH	Inorganic clays ranging from low to high plasticity (combination of CL and CH above)
OH	Organic clays of medium to high plasticity
PT	Peat and other highly organic soils.
Top-Soil	The upper portion of a soil, usually dark colored and rich in organic material.
FILL	Fill soils are materials that have been transported to their present location by man.
Lime-stone	A sedimentary rock consisting predominantly of calcium carbonate
Sand-stone	A sedimentary rock consisting of sand consolidated with some cement (clay or quartz etc.)
Silt-stone	A fine-grained rock of consolidated silt.
Shale	A fine-grained sedimentary rock consisting of compacted and hardened clay, silt, or mud.
PWR	Partially Weathered Rock

Boundary Classifications:
Soils possessing characteristics of two groups are designated by combinations of group symbols.

Undisturbed Sample (UD or SH)	Auger Cuttings (AU)
Split Spoon Sample (SS or SPT)	Bulk Sample (BK) or Grab Sample (GS)
Rock Core (RC)	No Recovery (NR)
Water Table at time of drilling	Water Table after drilling
WOH - Weight of Hammer	C Cave Depth

Correlation of Penetration Resistance (N) with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
Relative Density	No. of Blows	Consistency	No. of Blows
Very Loose	0 to 4	Very Soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Firm	11 to 20	Firm	5 to 8
Very Firm	21 to 30	Stiff	9 to 15
Dense	31 to 50	Very Stiff	16 to 30
Very Dense	Over 50	Hard	Over 30

Standard Penetration Resistance The Number of Blows of a 140 lb. Hammer Falling 30 in. Required to Drive a 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586. Also commonly referred to as an "N" value.

Estimated Relative Moisture Condition

Visual classification relative to assumed optimum moisture content (OMC) of standard proctor

Dry:	Air dry to dusty
Slightly Moist:	Dusty to approximately -2% OMC
Moist:	Approximately between ±2% OMC
Very Moist:	From approximately +2% to nearly saturated
Wet:	Contains free water or nearly saturated

Relative Hardness of Rock

Very Soft:	Can be broken with fingers
Soft:	Can be scratched with fingernail; Only edges can be broken with fingers
Moderately Hard:	Can be easily scratched with knife; Cannot be scratched with fingernail
Hard:	Difficult to scratch with knife; Hard hammer blow to break specimen
Very Hard:	Cannot be scratched with knife; Several hard hammer blows to break specimen

Rock Continuity

Core Recovery	Description
0 - 40%	Incompetent
40 - 70%	Competent
70 - 90%	Fairly Continuous
90 - 100%	Continuous

Rock Quality Designation

RQD	Rock Quality Classification
< 25%	Very Poor
25 - 50%	Poor
50 - 75%	Fair
75 - 90%	Good
90 - 100%	Very Good

REC Recovery - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%

RQD Rock Quality Designation - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

TEST BORING RECORD

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	DESCRIPTION	ELEV MSL (ft)	REMARKS
0	Poorly graded Gravel, with SAND and SILT; FILL	452.4	SURFACE COVER: GRAVEL
	LOOSE, Orange brown and greenish gray, very fine to fine grained, silty SAND (SM), with CLAY layers, moist to very moist; FILL		
5		447.4	
	FIRM, Dark greenish gray, lean CLAY (CL), very moist; FILL		
10		442.4	
	STIFF, Brown, sandy and silty, lean CLAY (CL), with SAND pockets, moist; ALLUVIUM		
15		437.4	
	VERY LOOSE to FIRM, Brown and dark orange, fine grained, silty SAND (SM), moist to very moist; ALLUVIUM		
20		432.4	
25		427.4	
30		422.4	
	FIRM, Brown and tan, very fine to coarse grained, silty, well graded SAND (SW-SM), with gravel and pebbles, moist; ALLUVIUM		
35		417.4	
40		412.4	
	LOOSE, Brown and dark orange, fine grained, poorly graded SAND (SP), moist to very moist; ALLUVIUM		
45	VERY FIRM, Brown and tan, very fine to coarse grained, silty SAND (SM), with gravel and pebbles, moist; ALLUVIUM	407.4	
50	BORING TERMINATED AT 50.0 FEET	402.4	BORING DRY UPON COMPLETION OF DRILLING
55		397.4	

REMARKS: Note: *No information on the borings should be used without considering the entire content of the main document.*

Sample Number	RECOV (in.)	N-COUNT (1st 6" / 2nd 6" / 3rd 6") RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve
SS-1	13	4-5-4 (N = 9)	14.8				48
SS-2	12	3-2-3 (N = 5)	24.7				
SS-3	10	4-4-5 (N = 9)					
UD-1	24		18.2	26	17		
SS-4	12	4-2-2 (N = 4)					
SS-5	14	4-5-4 (N = 9)	7.5				
SS-6	15	4-4-7 (N = 11)					
SS-7	15	7-7-9 (N = 16)					
UD-2	23		3.4				6
SS-8	13	2-7-7 (N = 14)	4.2				
SS-9	12	3-3-5 (N = 8)					
UD-3	24		16.1				20
SS-10	14	9-10-15 (N = 25)					

START DATE:	1/26/2010
CONTRACTOR:	Tri-State Drilling, LLC
DRILLER:	Shannon Snow
EQUIPMENT:	CME 55
METHOD:	HSA
HOLE DIA.:	4¼" ID
HAMMER:	Automatic
LOGGED BY:	Vandana Muddu
PREPARED BY:	Sarah Sheilley
REMARKS:	

TEST BORING RECORD

Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: [signature] **Boring No.: B-10C**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Depth (ft)	Description	Elev MSL (ft)	Sample Number	Recov (in.)	N-Count (1st 6" / 2nd 6" / 3rd 6")	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	Remarks
0	TOPSOIL; FILL	441.6									
	FIRM, Brown, silty and sandy, lean CLAY (CL), moist; ALLUVIUM		SS-1	18	3-4-3 (N = 7)	24.5					SURFACE COVER: GRASS
			SS-2	18	3-3-3 (N = 6)						
5		436.6	UD-1			20.4	25	17			
	LOOSE, Brown and light brown, fine to medium grained, silty SAND (SM), moist; ALLUVIUM		SS-3	16	2-3-3 (N = 6)						
10		431.6	UD-2			6.8				8	
	FIRM TO LOOSE, Brown and light brown, fine to medium grained, silty SAND (SM), with black striations, moist; ALLUVIUM		SS-4	18	3-5-6 (N = 11)						
15		426.6	UD-3								
			SS-5	18	2-3-5 (N = 8)	25.7					
20	BORING TERMINATED AT 20.0 FEET	421.6									BORING DRY UPON COMPLETION OF DRILLING
25		416.6									
30		411.6									
35		406.6									
40		401.6									
45		396.6									
50		391.6									
55		386.6									

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

Note: *No information on the borings should be used without considering the entire content of the main document.*

START DATE: 1/27/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: Dead Storage Pond / Basin Pond
Project No: 3143-10-1216
Checked By:
Boring No.: B-10T

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	Gravel, with SAND and SILT; FILL	453.0									SURFACE COVER: GRAVEL
	LOOSE to FIRM, Brown and gray, fine to coarse grained, silty SAND (SM), with gravel, moist; FILL										
5		448.0	SS-1	12	7-3-4 (N = 7)	27.6				50	
			SS-2	0	7-8-12 (N = 20)						
10	STIFF to VERY SOFT, Gray and dark greenish gray, very fine to coarse grained, silty, lean CLAY (CL), with gravel, moist to wet, with ASH (CCW); FILL	443.0	UD-1	24		17.6	28	18		87	
15		438.0	SS-3	16	5-5-6 (N = 11)						
20		433.0	SS-4	7	2-1-0 (N = 1)	21.0					
			UD-2	0							
	LOOSE, Orange brown and dark gray, very fine to coarse grained, silty SAND (SM), moist to wet; ALLUVIUM										
25		428.0	SS-5	18	3-4-4 (N = 8)						
	▽		UD-3	24		24.6	20	17		31	
30		423.0	SS-6	18	3-3-4 (N = 7)						
35		418.0	SS-7	18	4-3-4 (N = 7)	23.5					
40	LOOSE to VERY FIRM, Dark gray and tan, fine to coarse grained, silty, well graded SAND (SW-SM), with gravel and pebbles, wet; ALLUVIUM	413.0	SS-8	18	5-4-4 (N = 8)	18.4					
45		408.0	SS-9	18	5-6-9 (N = 15)	12.3					
50	BORING TERMINATED AT 50.0 FEET	403.0	SS-10	15	6-8-13 (N = 21)	4.4					BORING DRY UPON COMPLETION OF DRILLING
55		398.0									

START DATE: 1/26/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 55
METHOD: HSA
HOLE DIA.: 4¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: Dead Storage Pond / Basin Pond
Project No: 3143-10-1216
Checked By: [signature]
Boring No.: **B-11C**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: *No information on the borings should be used without considering the entire content of the main document.*)
0	TOPSOIL; FILL SOFT, Dark gray, silty SAND (SM), wet; FILL	441.3	SS-1		18	1-1-1 (N = 2)	35.9					SURFACE COVER: GRASS
	FIRM, Gray with brown, lean CLAY (CL) with ASH (CCW), moist to wet; FILL		SS-2		18	1-3-5 (N = 8)	26.5					
5		436.3										
			SS-3		18	4-3-2 (N = 5)	44.5					
10		431.3										
	FIRM to LOOSE, Dark gray, silty SAND (SM), moist; ALLUVIUM		SS-4		18	4-6-5 (N = 11)	37.3					
15		426.3										
	C											BORING CAVED IN AT A DEPTH OF 17 FEET UPON COMPLETION OF DRILLING
			SS-5		18	1-3-2 (N = 5)	51.9					
20		421.3										
	LOOSE, Brown and tan, fine to medium grained, poorly graded SAND (SP), wet; ALLUVIUM		SS-6		18	3-3-4 (N = 7)	32.2					
25	BORING TERMINATED AT 25.0 FEET	416.3										BORING DRY UPON COMPLETION OF DRILLING
30		411.3										
35		406.3										
40		401.3										
45		396.3										
50		391.3										
55		386.3										

START DATE: 1/28/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: Dead Storage Pond / Basin Pond
Project No: 3143-10-1216
Checked By: SAS
Boring No.: B-11T

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT (1st 6" 2nd 6" 3rd 6") / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	Gravel with SAND and SILT; FILL	449.8									SURFACE COVER: GRAVEL
	STIFF, Orange brown and gray, silty and sandy, lean CLAY (CL), with black oxides, moist; FILL		SS-1	12	5-5-5 (N = 10)						
5		444.8	UD-1	18		21.6	36	20			
10		439.8	SS-2	12	5-6-7 (N = 13)						
	SOFT to FIRM, Gray, fine to medium grained, silty, lean CLAY (CL), very moist to wet, with ASH (CCW); FILL										
15		434.8	SS-3	18	2-1-2 (N = 3)	42.9					
20		429.8	SS-4	18	2-2-5 (N = 7)						
			UD-2			47.8					
	LOOSE, Gray and tan, very fine to fine grained, silty SAND (SM), very moist to wet; ALLUVIUM										
25		424.8	SS-5	15	4-3-3 (N = 6)						
30		419.8	SS-6	12	3-2-4 (N = 6)	6.6					
35		414.8	SS-7	14	3-2-5 (N = 7)	25.9					
	LOOSE to DENSE, Gray, tan and orange brown, fine to coarse grained, silty, well graded SAND (SW-SM), with gravel and pebbles, very moist to wet; ALLUVIUM										
40		409.8	SS-8	10	3-3-6 (N = 9)	6.0					
			UD-3	0		5.2				7	
45		404.8	SS-9	13	6-11-23 (N = 34)	2.3					BORING CAVED IN AT A DEPTH OF 47.5 FEET UPON COMPLETION OF DRILLING
50	BORING TERMINATED AT 50.0 FEET	399.8	SS-10	14	20-22-25 (N = 47)	7.7					BORING DRY UPON COMPLETION OF DRILLING
55		394.8									

START DATE: 1/27/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Shannon Snow
EQUIPMENT: CME 55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Vandana Muddu
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: Dead Storage Pond / Basin Pond
Project No: 3143-10-1216
Checked By: Adg
Boring No.: B-12C

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	LEGEND	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: *No information on the borings should be used without considering the entire content of the main document.*)
0	TOPSOIL; FILL FIRM, Brown, silty, lean CLAY (CL), moist; FILL		441.7	SS-1		18	3-3-3 (N = 6)	25.3					SURFACE COVER: GRASS
5	LOOSE, Dark gray, silty SAND (SM), wet; ALLUVIUM		436.7	SS-2		18	1-3-3 (N = 6)	40.0					
10	LOOSE, Dark brown and gray, silty SAND (SM), wet, with gravel; ALLUVIUM		431.7	SS-3		18	1-2-4 (N = 6)	45.6					
15		C	426.7	SS-4		18	1-3-2 (N = 5)	32.7					BORING CAVED IN AT A DEPTH OF 13 FEET UPON COMPLETION OF DRILLING
	FIRM, Dark gray, silty SAND (SM), wet; ALLUVIUM												
20	LOOSE, Brown to light brown, fine to medium grained, poorly graded SAND (SP), moist; ALLUVIUM BORING TERMINATED AT 20.0 FEET		421.7	SS-5		18	3-4-5 (N = 9)	30.6					BORING DRY UPON COMPLETION OF DRILLING
25			416.7										
30			411.7										
35			406.7										
40			401.7										
45			396.7										
50			391.7										
55			386.7										

START DATE: 1/28/2010
CONTRACTOR: Tri-State Drilling, LLC
DRILLER: Mark Williams
EQUIPMENT: CME 45
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: Dead Storage Pond / Basin Pond
Project No: 3143-10-1216
Checked By: SAS
Boring No.: B-12T

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 31431101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Project:	Cane Run Station - Dead Storage/Basin Pond Crest Borings
Project No.:	3143-10-1216
Prepared By:	ALB	Date: 01/29/10
Checked By:	NRJ	Date: 02/17/10

Statistical Analysis of Standard Penetration Test (SPT) Resistances (N-values)

Depth* (feet)	B-10C	B-11C	B-12C	Min.	Max.	Std. Dev.	Var.	Avg.
				Statistical Analysis				
1.5	-	-	-					
3.5	-	-	-	-	-	-	-	-
5.0	9	7	10	7	10	1	2	8
7.0	-	-	UD	-	-	-	-	-
10.0	5	20	13	5	20	7	56	12
12.0	-	UD	-	-	-	-	-	-
15.0	9	11	3	3	11	4	17	7
17.0	UD	-	-	-	-	-	-	-
20.0	4	1	7	1	7	3	9	4
22.0	-	UD	UD	-	-	-	-	-
25.0	9	8	6	6	9	1	2	7
27.0	-	UD	-	-	-	-	-	-
30.0	11	7	6	6	11	2	7	8
32.0	-	-	-	-	-	-	-	-
35.0	16	7	7	7	16	5	27	10
37.0	UD	-	-	-	-	-	-	-
40.0	14	8	9	8	14	3	10	10
42.0	-	-	UD	-	-	-	-	-
45.0	8	15	34	8	34	13	181	19
47.0	UD	-	-	-	-	-	-	-
50.0	25	21	47	21	47	14	196	31
				1	47	9	91	11

Gravel
SM (Fill)
CL (Fill)
SM (Alluvium)
CL (Alluvium)
SP (Alluvium)
SW-SM (Alluvium)

Note(s): *Indicates bottom depth of sample.

MACTEC

Project:	Cane Run Station - Dead Storage/Basin Pond Toe Borings		
Project No.:	3143-10-1216		
Prepared By:	ALB	Date:	01/29/10
Checked By:	NRJ	Date:	02/17/10

Statistical Analysis of Standard Penetration Test (SPT) Resistances (N-values)

Depth* (feet)				Statistical Analysis				
	B-10T	B-11T	B-12T	Min.	Max.	Std. Dev.	Var.	Avg.
1.5	7	2	6	2	7	2	7	5
3.5	-	-	-	-	-	-	-	-
5.0	6	8	6	6	8	1	1	6
7.0	UD	-	-	-	-	-	-	-
10.0	6	5	6	5	6	0	0	5
12.0	UD	-	-	-	-	-	-	-
15.0	11	11	5	5	11	3	12	9
17.0	UD	-	-	-	-	-	-	-
20.0	8	5	9	5	9	2	4	7
22.0		-		-	-	-	-	-
25.0		7		7	7	-	-	7
				2	11	2	5	6

SM (Fill)
CL (Fill)
SM (Alluvium)
CL (Alluvium)
SP (Alluvium)
SW-SM (Alluvium)

Note(s): *Indicates bottom depth of sample.

SUMMARY OF LABORATORY RESULTS

Borehole	Depth	Sample Type	Atterberg Limits			USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf)		Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core		% Finer #200
			Liquid Limit	Plastic Limit	Plasticity Index					Dry Density	Wet Density				RQD	Percent Recovery	
B-10C	3.5	SS				SM	14.8										48
B-10C	8.5	SS					24.7										
B-10C	15.0	UD	26	17	9	CL	18.2			105.3	124.5			2.67			
B-10C	23.5	SS					7.5										
B-10C	35.0	UD				SW-SM	3.4			104.2	107.7			2.71			6
B-10C	38.5	SS					4.2										
B-10C	45.0	UD				SM	16.1			92.9	107.9			2.71			20
B-10T	0.0	SS					24.5										
B-10T	5.0	UD	25	17	8	CL-ML	20.4			114.8	138.3			2.69			
B-10T	10.0	UD				SC	6.8			90.1	96.2			2.65			8
B-10T	18.5	SS					25.7										
B-11C	3.5	SS				SM	27.6										50
B-11C	10.0	UD	28	18	10	CL	17.6			106.4	125.2			2.74			87
B-11C	18.5	SS					21.0										
B-11C	25.0	UD	20	17	3	SM	24.6			96.6	120.4			2.68			31
B-11C	33.5	SS					23.5										
B-11C	38.5	SS					18.4										
B-11C	43.5	SS					12.3										
B-11C	48.5	SS					4.4										
B-11T	0.0	SS					35.9										
B-11T	3.5	SS					26.5										
B-11T	8.5	SS					44.5										
B-11T	13.5	SS					37.3										
B-11T	18.5	SS					51.9										
B-11T	23.5	SS					32.2										
B-12C	5.0	UD	36	20	16	CL	21.6			105.4	128.2			2.75			

Remarks:

* SPT/SS = Split-spoon
UD/SH = Undisturbed sample
BG = Bulk / bag sample
RC = Rock core

Summary of Laboratory Results

Project: Dead Storage Pond / Basin Pond
Project No: 3143-10-1216
Checked By:

MACTEC

MACTEC_LAB-SUMMARY LANDSCAPE (SP GRAV) 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Borehole	Depth	Sample Type	Atterberg Limits			USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Unconfined Compress. Strength (Rock-psi)	Unit Weight (pcf)		Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Specific Gravity	Rock Core		% Finer #200
			Liquid Limit	Plastic Limit	Plasticity Index					Dry Density	Wet Density				RQD	Percent Recovery	
B-12C	13.5	SS					42.9										
B-12C	20.0	UD					47.8			70.6	104.4			2.54			
B-12C	28.5	SS					6.6										
B-12C	33.5	SS					25.9										
B-12C	38.5	SS					6.0										
B-12C	40.0	UD				SW-SM	5.2							2.69			7
B-12C	43.5	SS					2.3										
B-12C	48.5	SS					7.7										
B-12T	0.0	SS					25.3										
B-12T	3.5	SS					40.0										
B-12T	8.5	SS					45.6										
B-12T	13.5	SS					32.7										
B-12T	18.5	SS					30.6										

Remarks:

* SPT/SS = Split-spoon   BG = Bulk / bag sample
UD/SH = Undisturbed sample   RC = Rock core

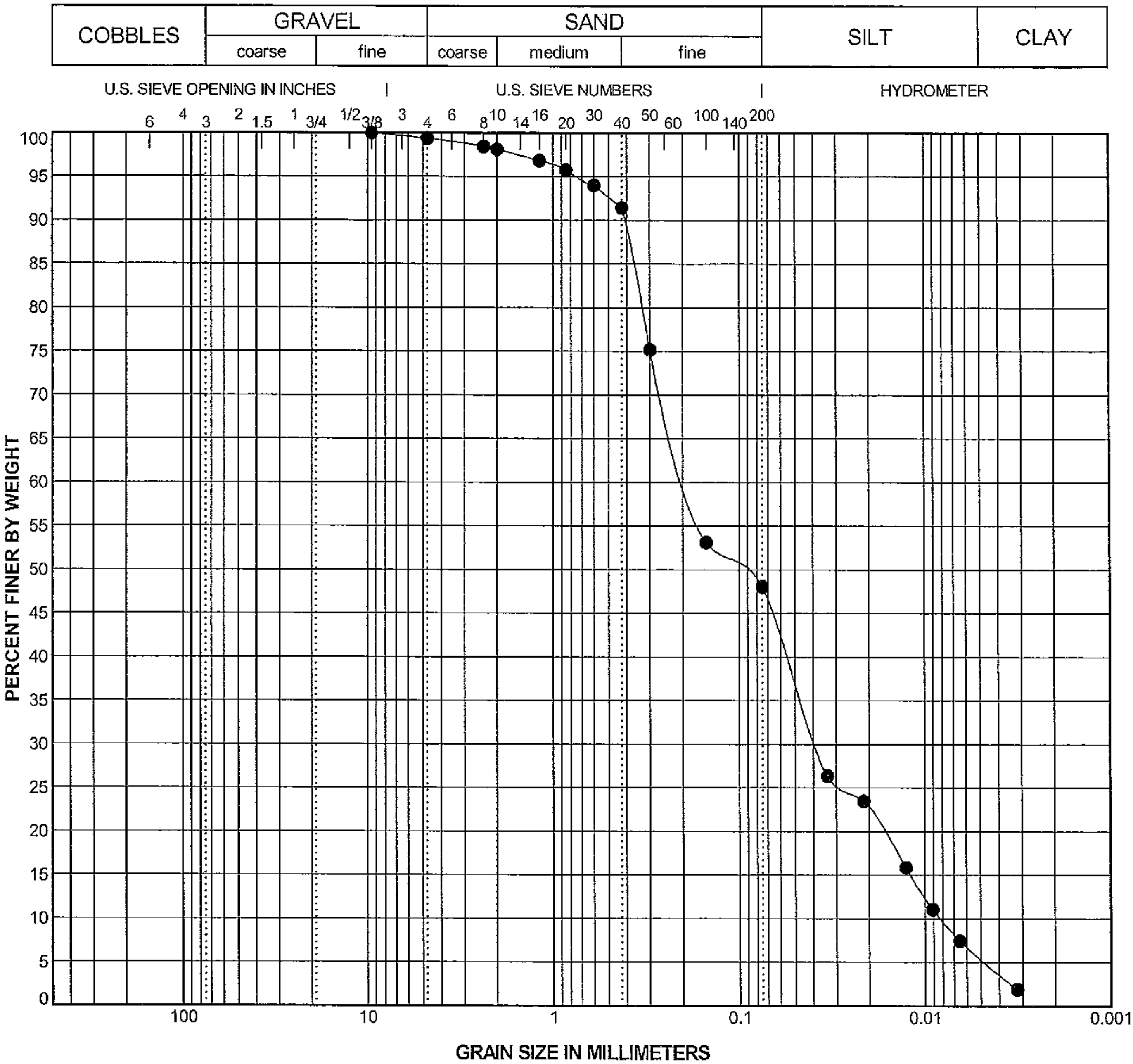
Summary of Laboratory Results

Project: Dead Storage Pond / Basin Pond
Project No: 3143-10-1216
Checked By: [illegible]

MACTEC

MACTEC_LAB-SUMMARY LANDSCAPE (SP GRAV) 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

GRAIN SIZE DISTRIBUTION TEST RESULTS



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-10C	3.5-5.0	Brown, silty SAND	SM	9.5	0.186	0.038	0.008	0.96	22.66

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

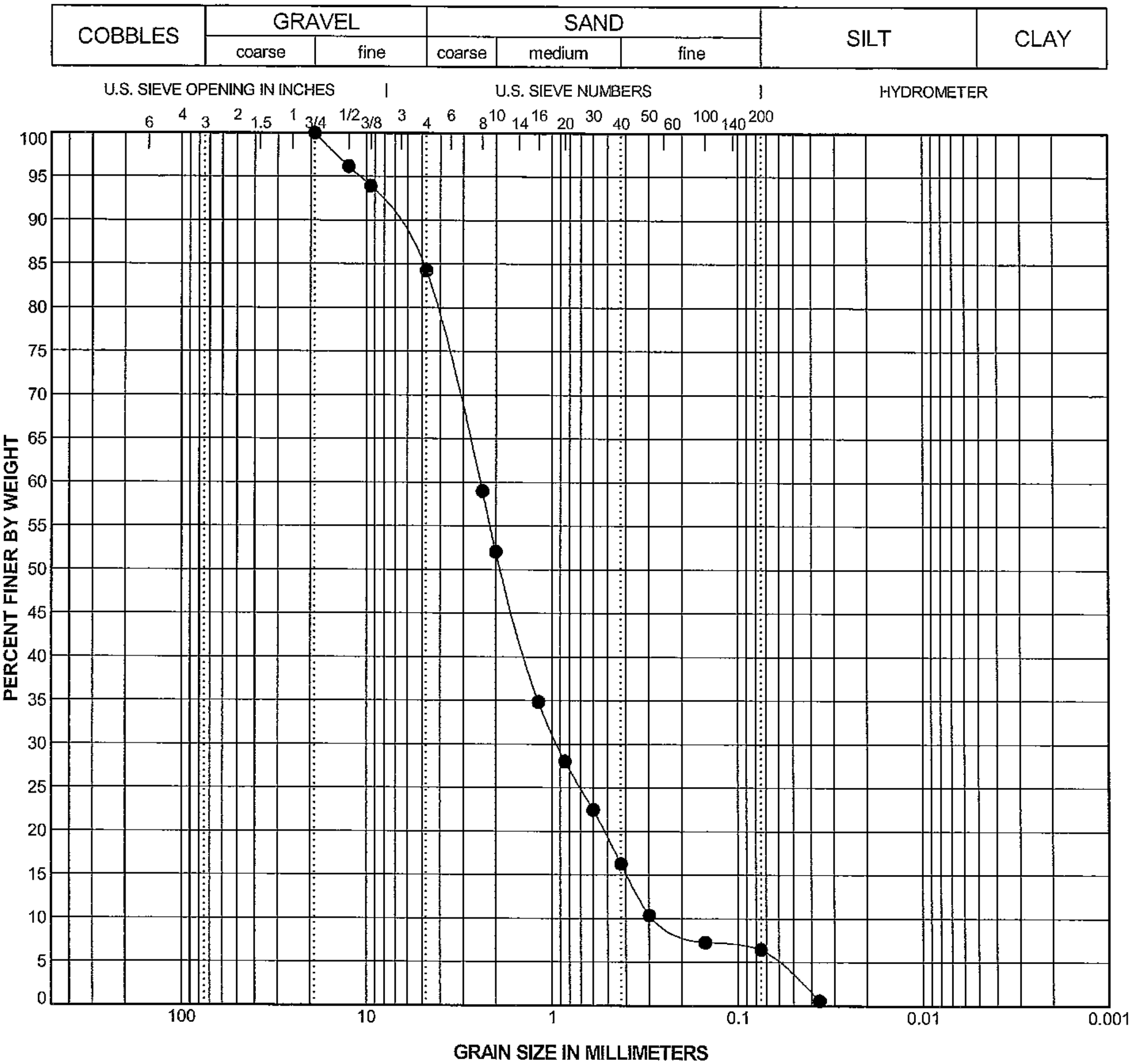
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 3143101216 DEAD BASIN POND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-10C	35.0-37.0	Brown, silty, well graded SAND	SW-SM	19	2.423	0.934	0.275	1.31	8.81

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

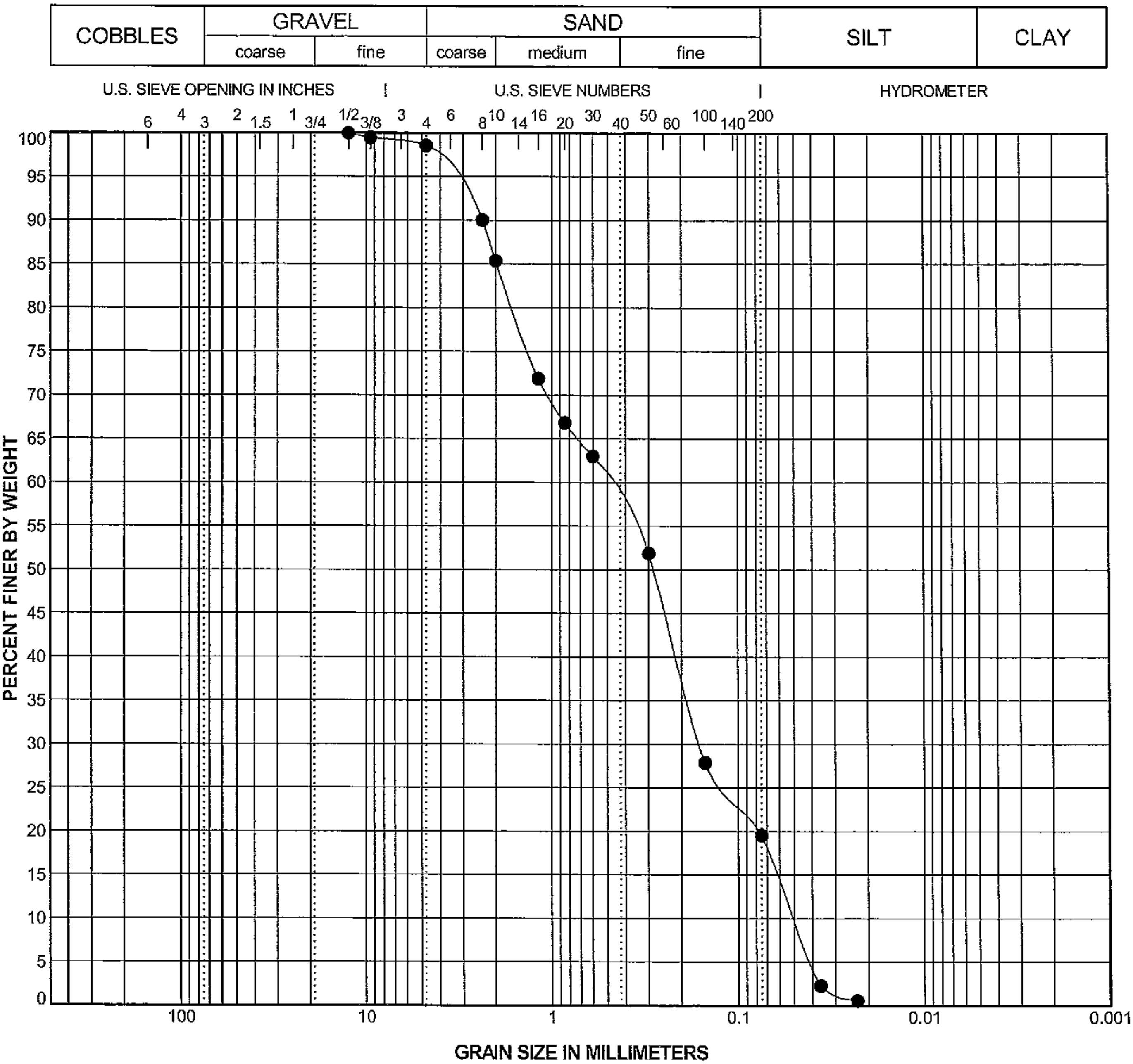
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: JAB

MACTEC

MACTEC_GRAIN_SIZE 3143101216 DEAD BASIN POND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-10C	45.0-47.0	Brown, silty SAND	SM	12.5	0.497	0.159	0.05	1.02	9.94

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

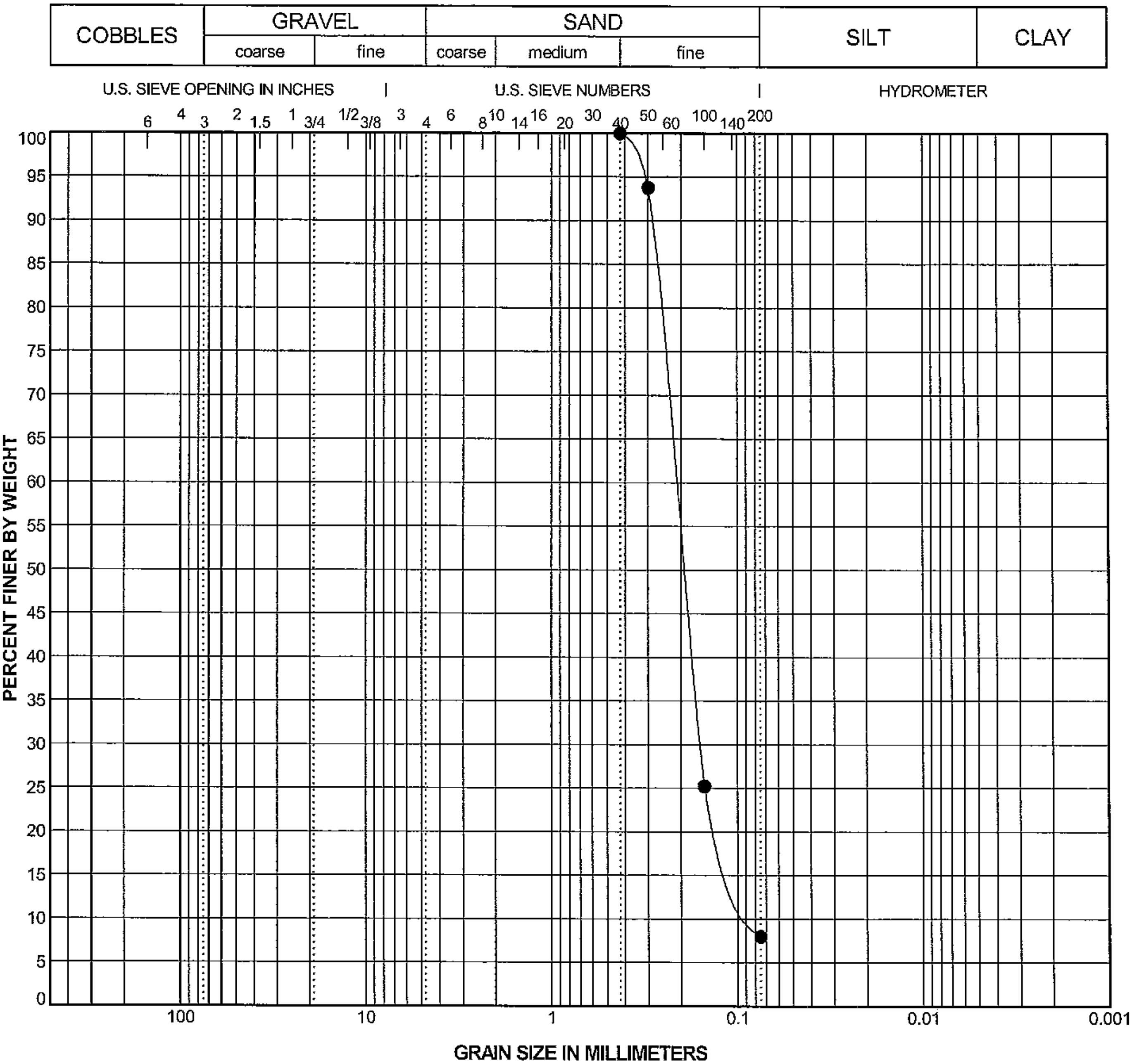
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: ADS

MACTEC

MACTEC_GRAIN_SIZE 3143101216 DEAD BASIN POND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-10T	10.0-12.0	Brown, clayey SAND	SC	0.425	0.213	0.157	0.081	1.43	2.62

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

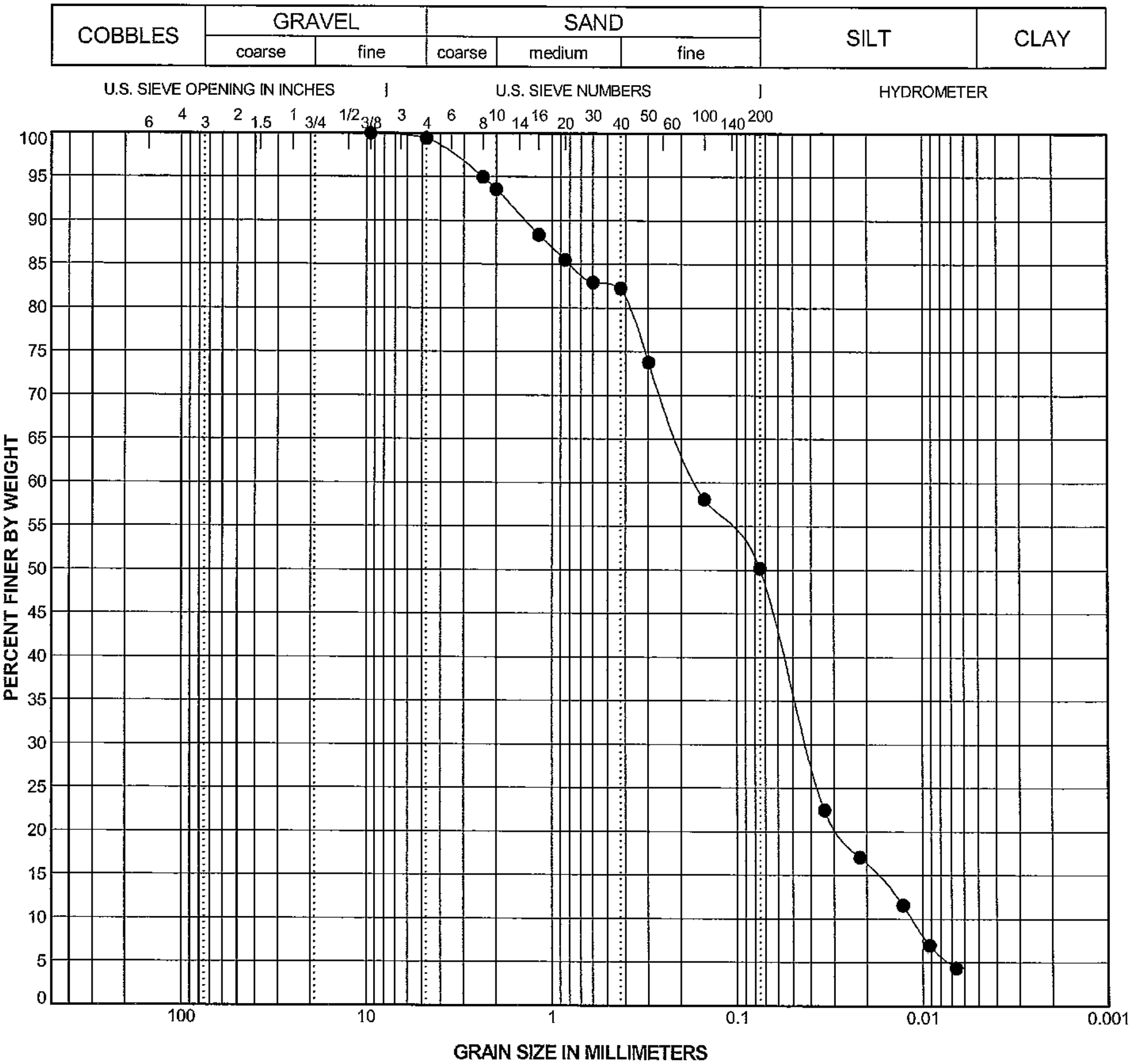
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: Ads

MACTEC

MACTEC_GRAIN_SIZE 3143101216 DEAD BASIN POND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-11C	3.5-5.0	Brown, silty SAND	SM	9.5	0.163	0.042	0.011	0.95	14.29

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

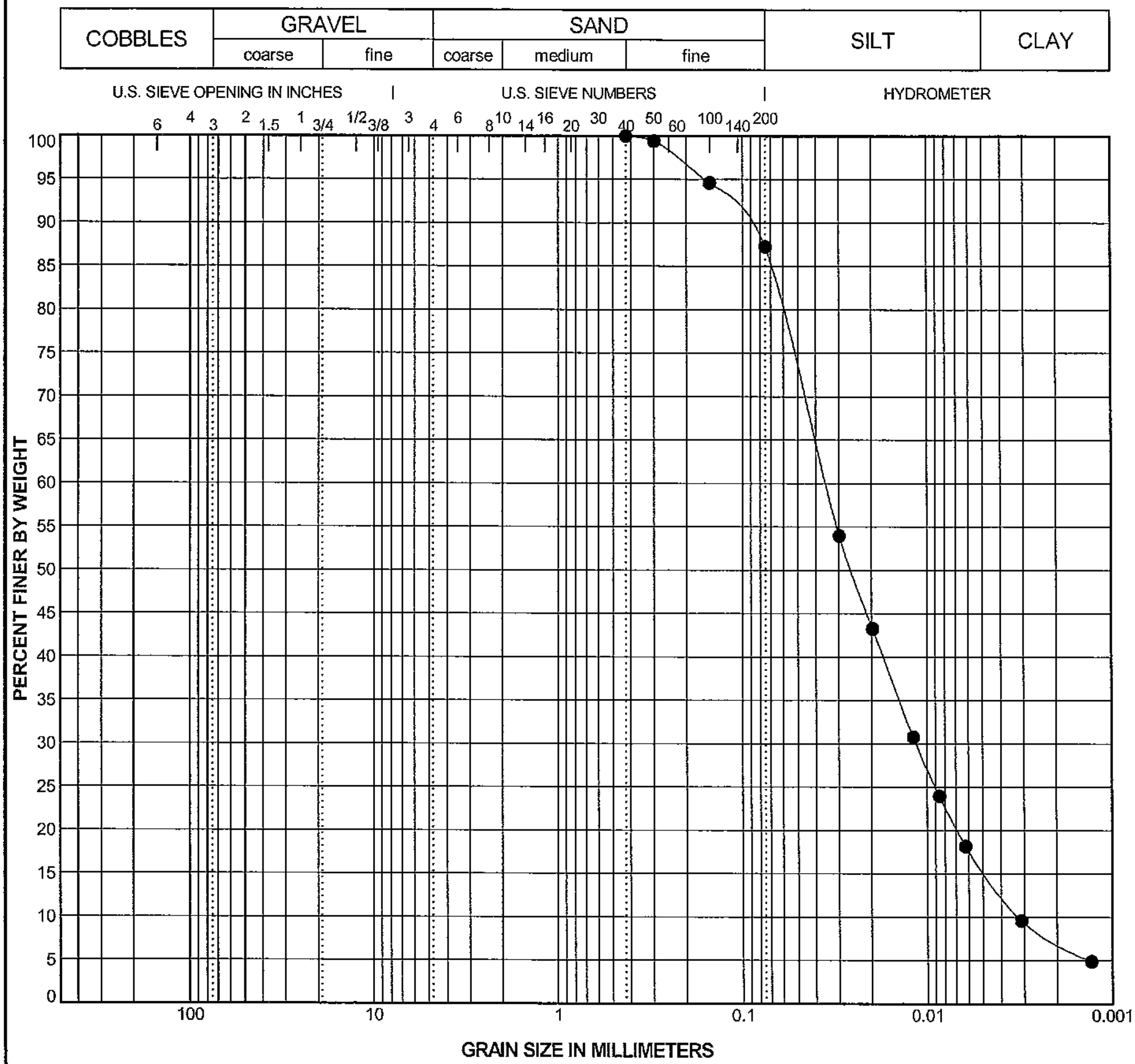
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: AJB

MACTEC

MACTEC_GRAIN_SIZE 3143101216 DEAD BASIN POND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-11C	10.0-12.0	Gray, lean CLAY	CL	0.425	0.035	0.011	0.003	1.16	10.99

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

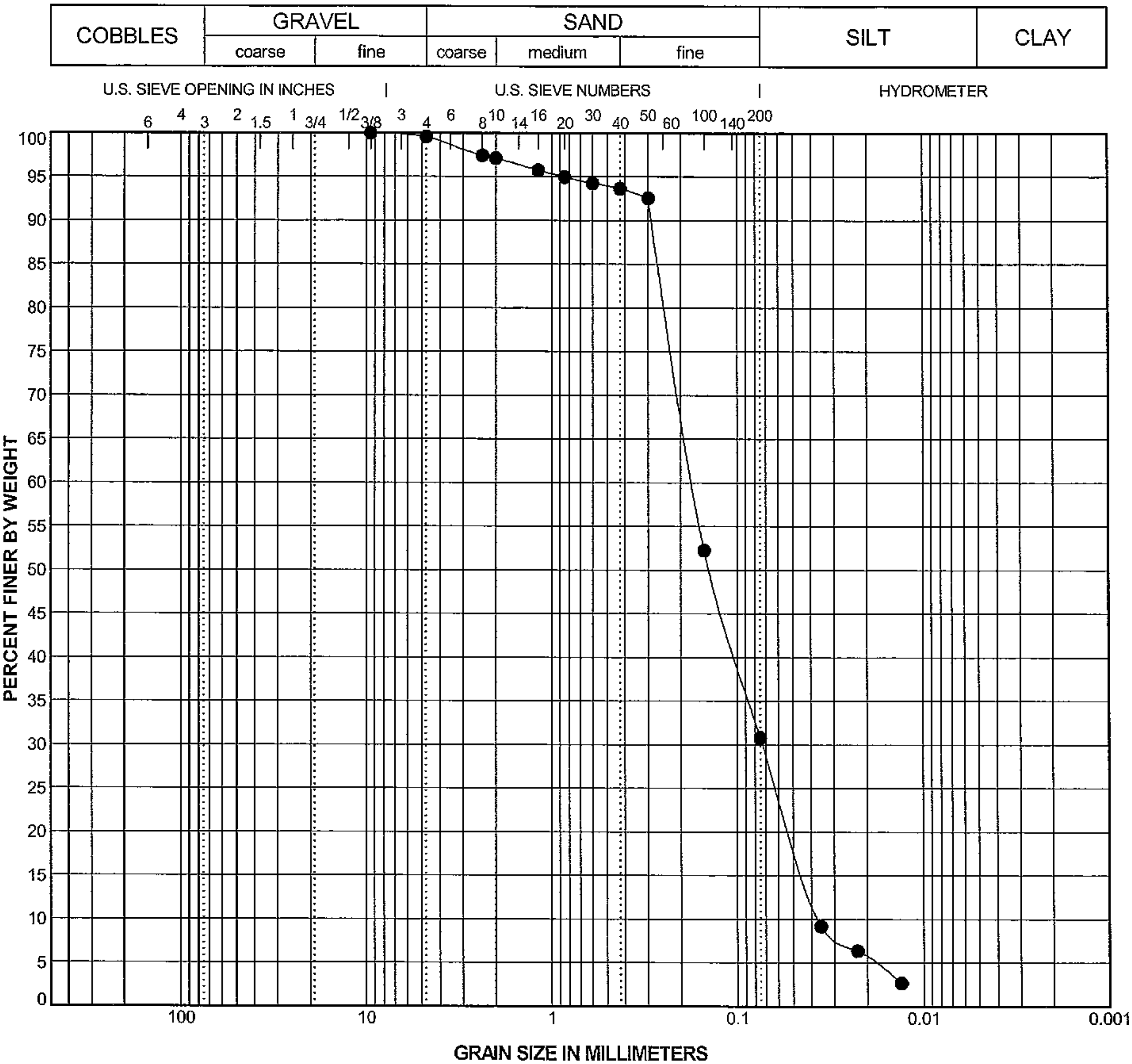
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 3143101216 DEAD BASIN POND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-11C	25.0-27.0	Orange brown, silty SAND	SM	9.5	0.171	0.073	0.036	0.85	4.71

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

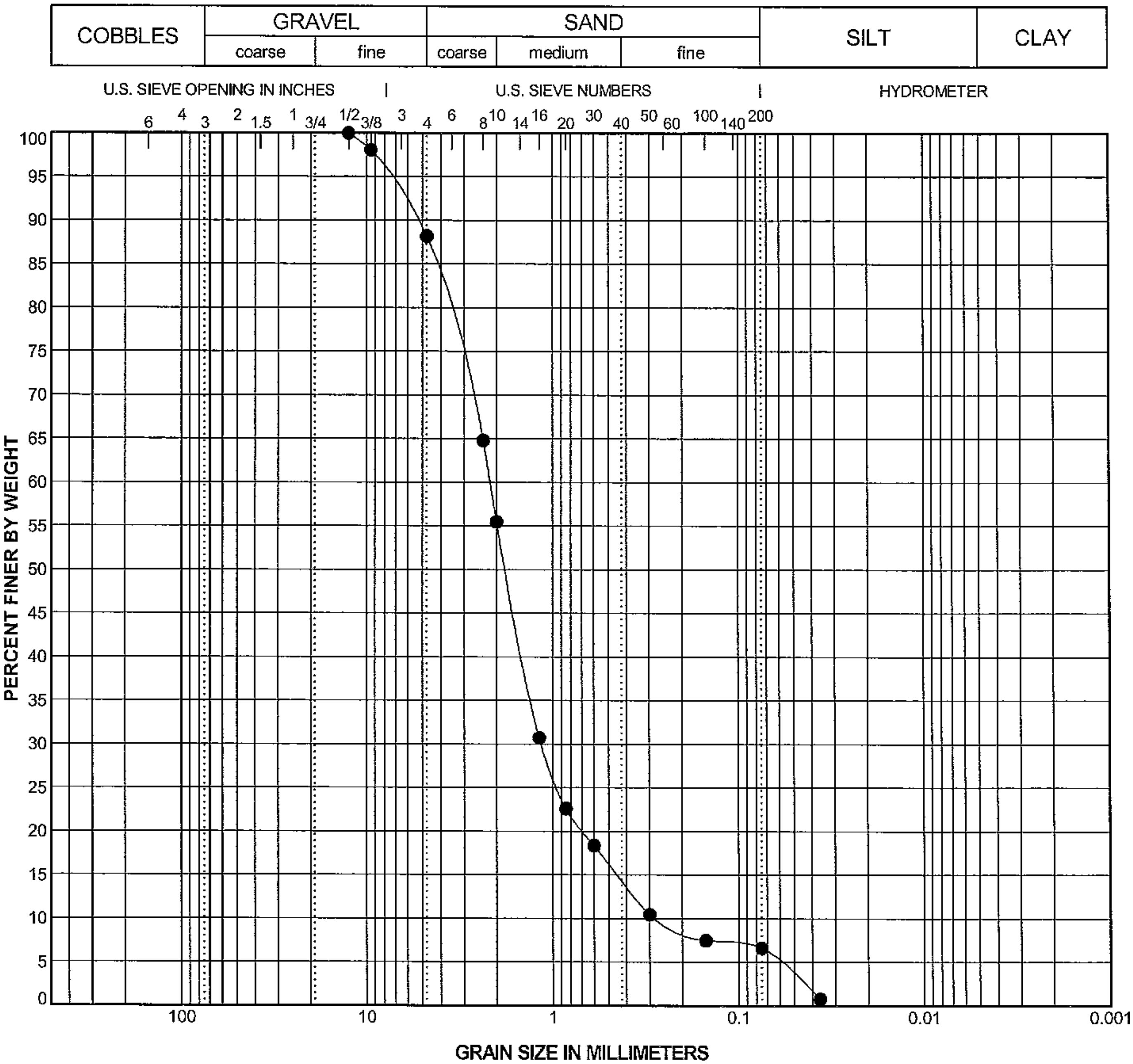
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: AS

MACTEC

MACTEC_GRAIN_SIZE 3143101216 DEAD BASIN POND.GPJ LAW_GIBB.GDT 2/22/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-12C	40.0-42.0	Brown, silty, well graded SAND	SW-SM	12.5	2.166	1.146	0.269	2.25	8.05

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

Project: Dead Storage Pond / Basin Pond

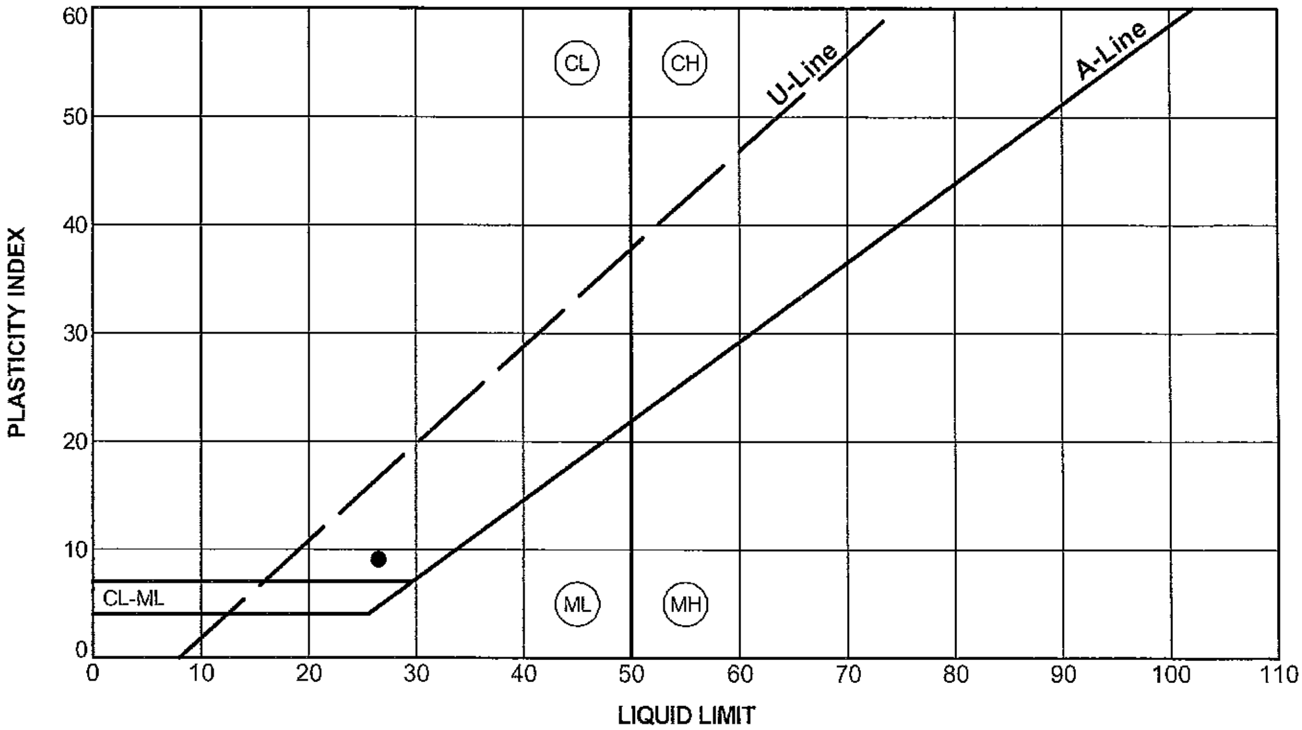
Project No: 3143-10-1216

Checked By: ADS

MACTEC

MACTEC_GRAIN_SIZE 3143101216 DEAD BASIN POND.GPJ LAW_GIBB.GDT 2/22/10

ATTERBERG LIMITS TEST RESULTS



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-10C	15.0-17.0	26	17	9	18.2	0.1	CL	Brown, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

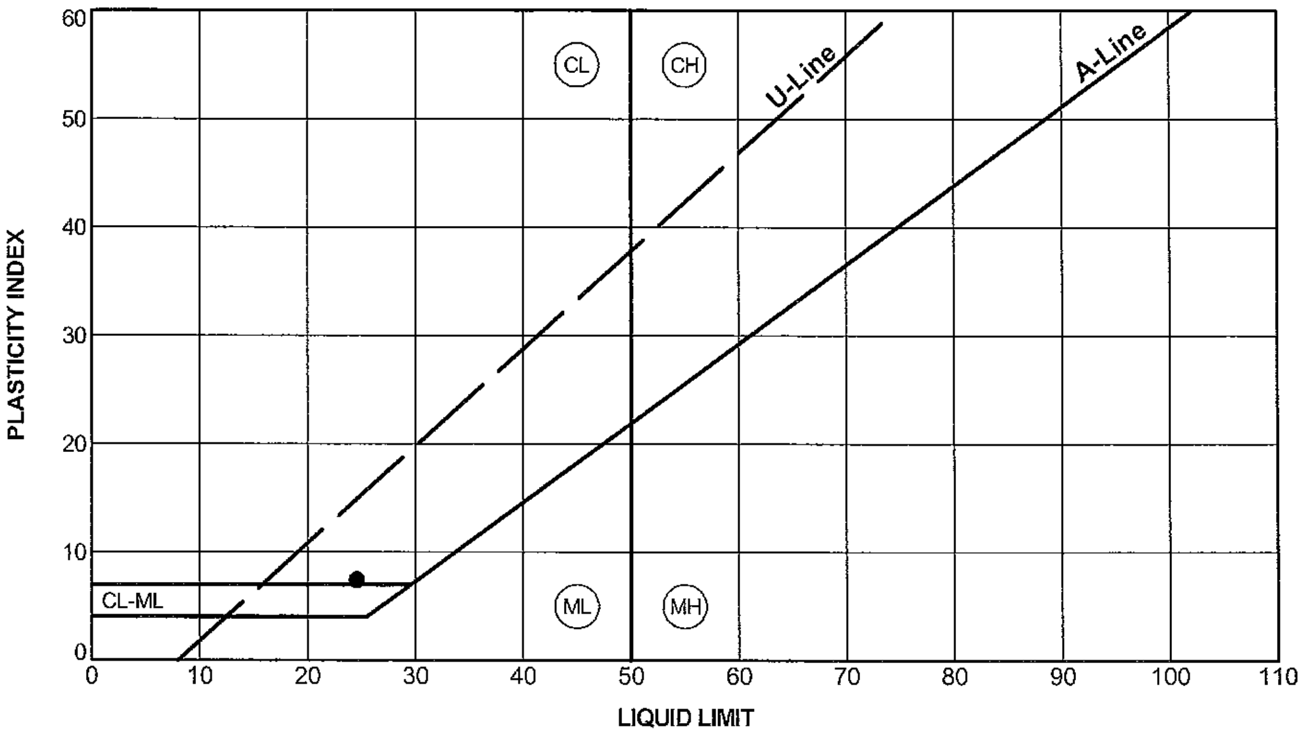
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: [signature]

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-10T	5.0-7.0	25	17	8	20.4	0.4	CL-ML	Brown, silty, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

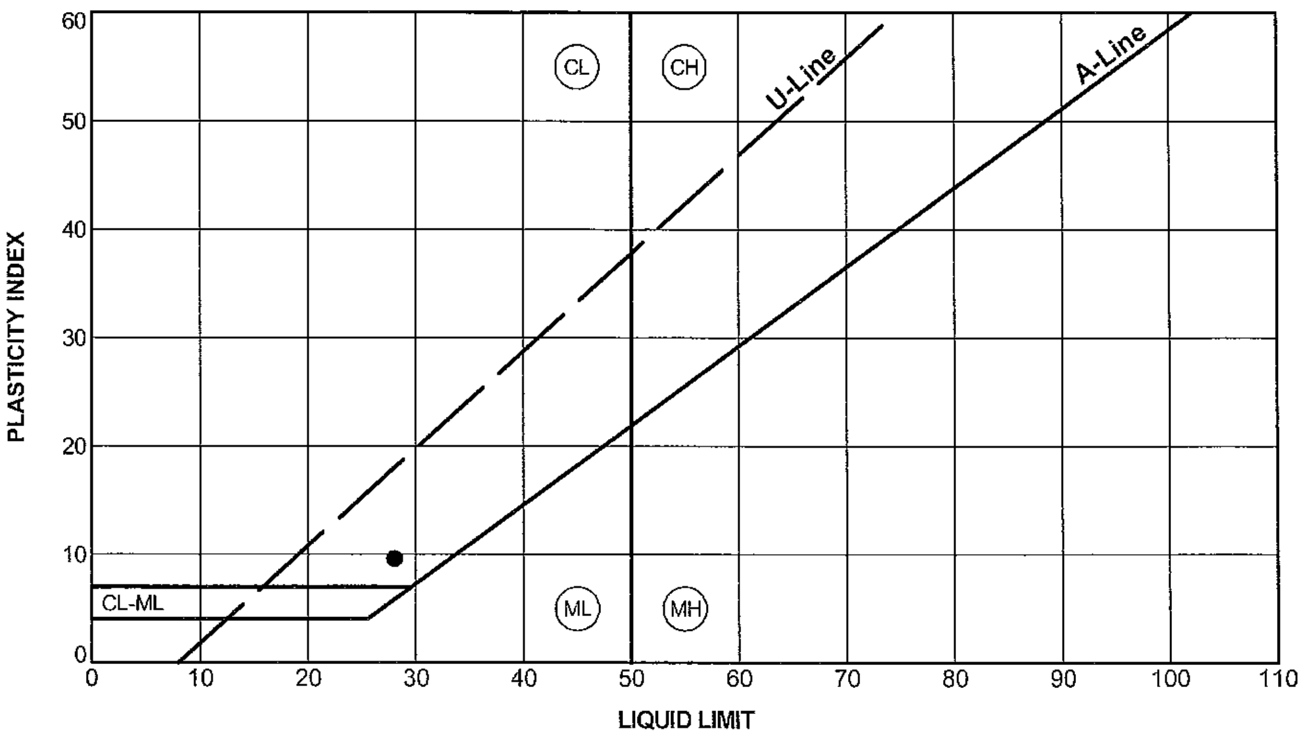
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By:

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-11C	10.0-12.0	28	18	10	17.6	-0.1	CL	Gray, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

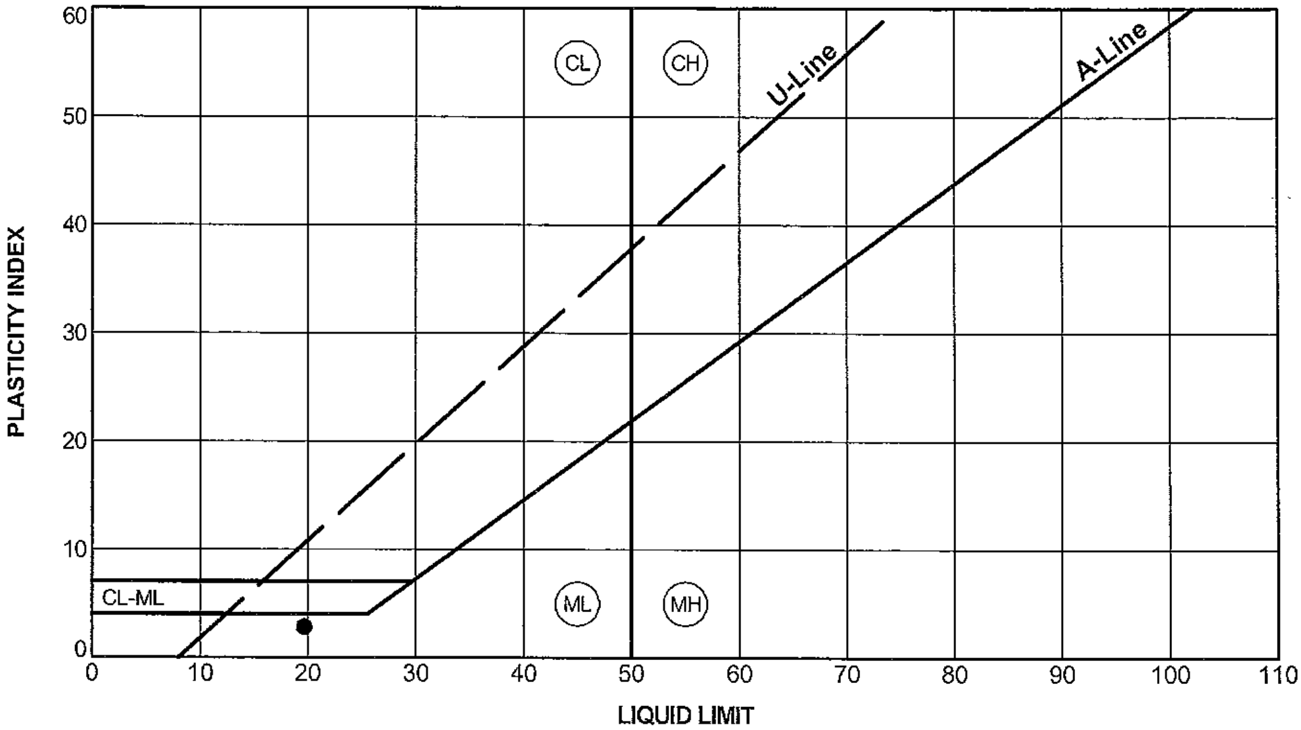
ATTERBERG LIMITS RESULTS

Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: AJS

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-11C	25.0-27.0	20	17	3	24.6	2.7	SM	Orange brown, silty SAND

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

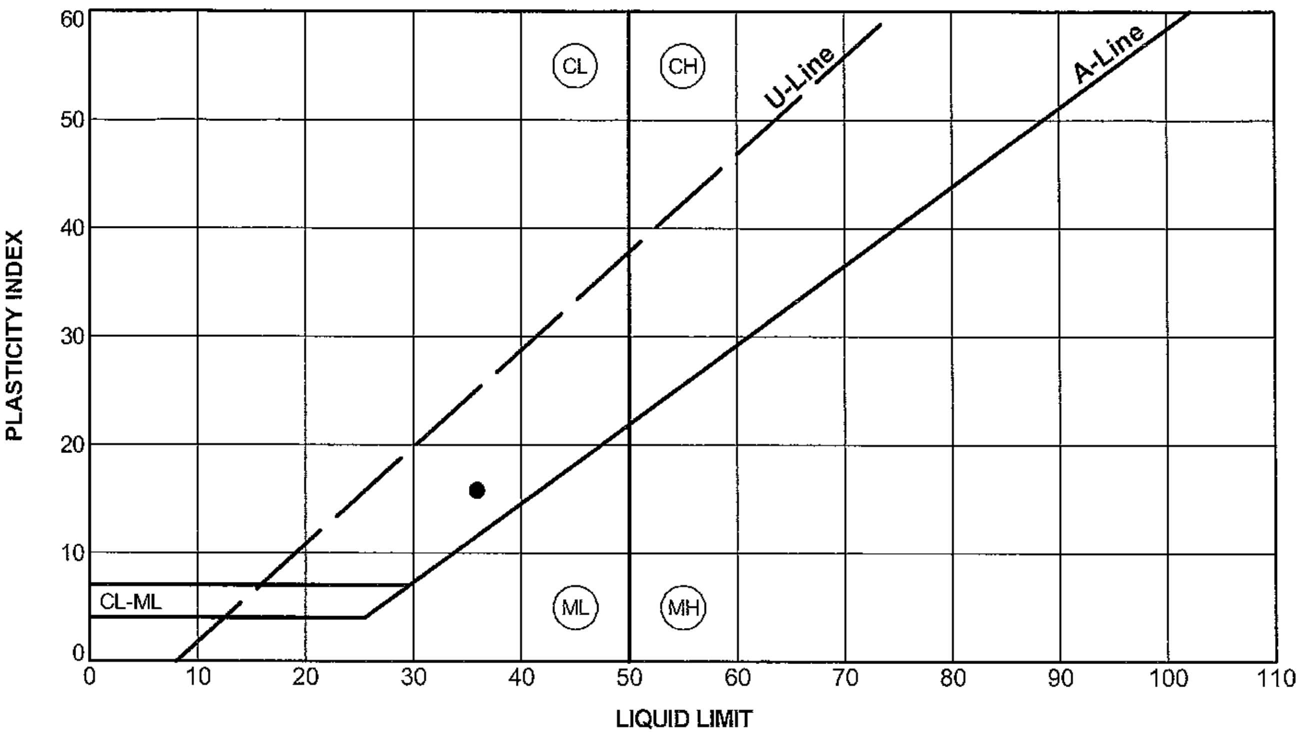
Project: Dead Storage Pond / Basin Pond

Project No: 3143-10-1216

Checked By: ADS

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-12C	5.0-7.0	36	20	16	21.6	0.1	CL	Orange brown, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101216 DEAD BASIN POND.GPJ MACTEC DATABASE TEMPLATE 01.GDT 2/22/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

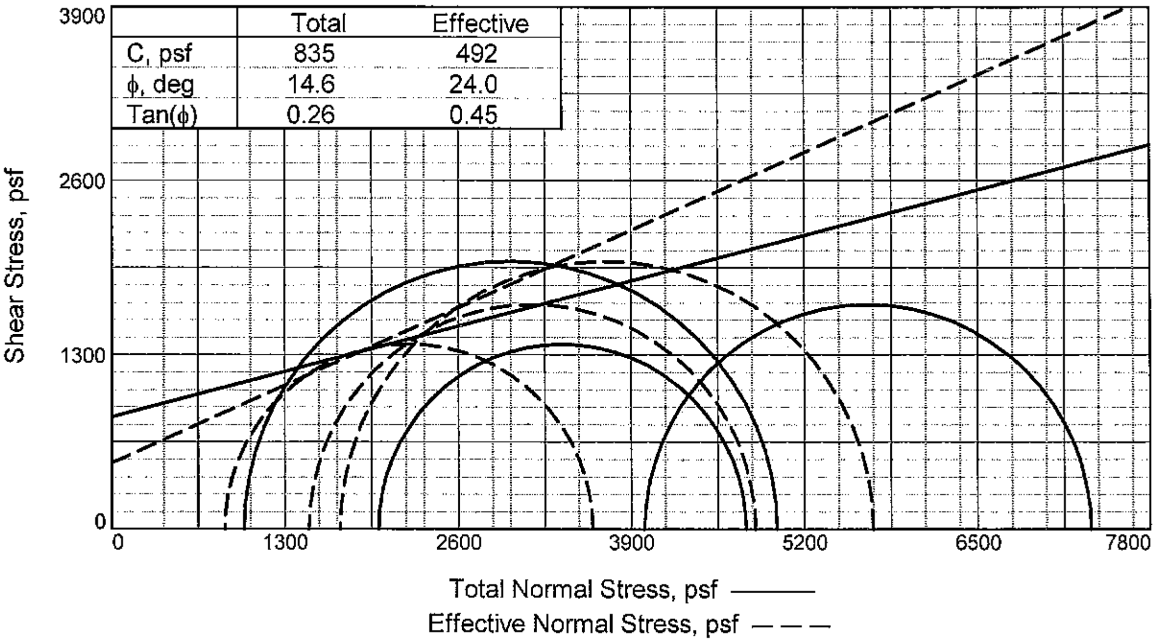
Project: Dead Storage Pond / Basin Pond

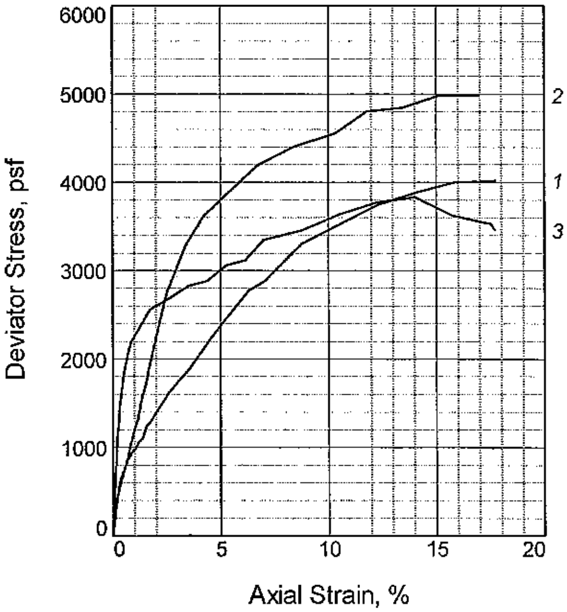
Project No: 3143-10-1216

Checked By: AJZ

MACTEC

TRIAXIAL SHEAR TEST RESULTS





Sample No.		1	2	3
Initial	Water Content, %	18.3	18.9	20.0
	Dry Density, pcf	105.2	107.5	107.1
	Saturation, %	82.1	89.5	94.1
	Void Ratio	0.6027	0.5687	0.5743
	Diameter, in.	2.83	2.87	2.83
	Height, in.	5.70	5.98	5.75
At Test	Water Content, %	22.1	20.2	19.9
	Dry Density, pcf	105.6	109.1	109.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5968	0.5444	0.5384
	Diameter, in.	2.83	2.86	2.81
	Height, in.	5.69	5.95	5.70
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		68.00	48.00	48.00
Cell Pressure, psi		74.90	61.90	75.80
Fail. Stress, psf		4002	2763	3351
Total Pore Pr., psf		9072	8064	9432
Ult. Stress, psf		1632	1531	1529
Total Pore Pr., psf		10080	8280	7171
$\bar{\sigma}_1$ Failure, psf		5716	3612	4834
$\bar{\sigma}_3$ Failure, psf		1714	850	1483

Type of Test:
CU with Pore Pressures

Sample Type: UD

Description: Brown, lean CLAY (CL)

Specific Gravity= 2.7

Remarks:

Figure ______

Client: LG&E

Project: LG&E Cane Run Station

Location: Dead Storage Pond / Basin Pond

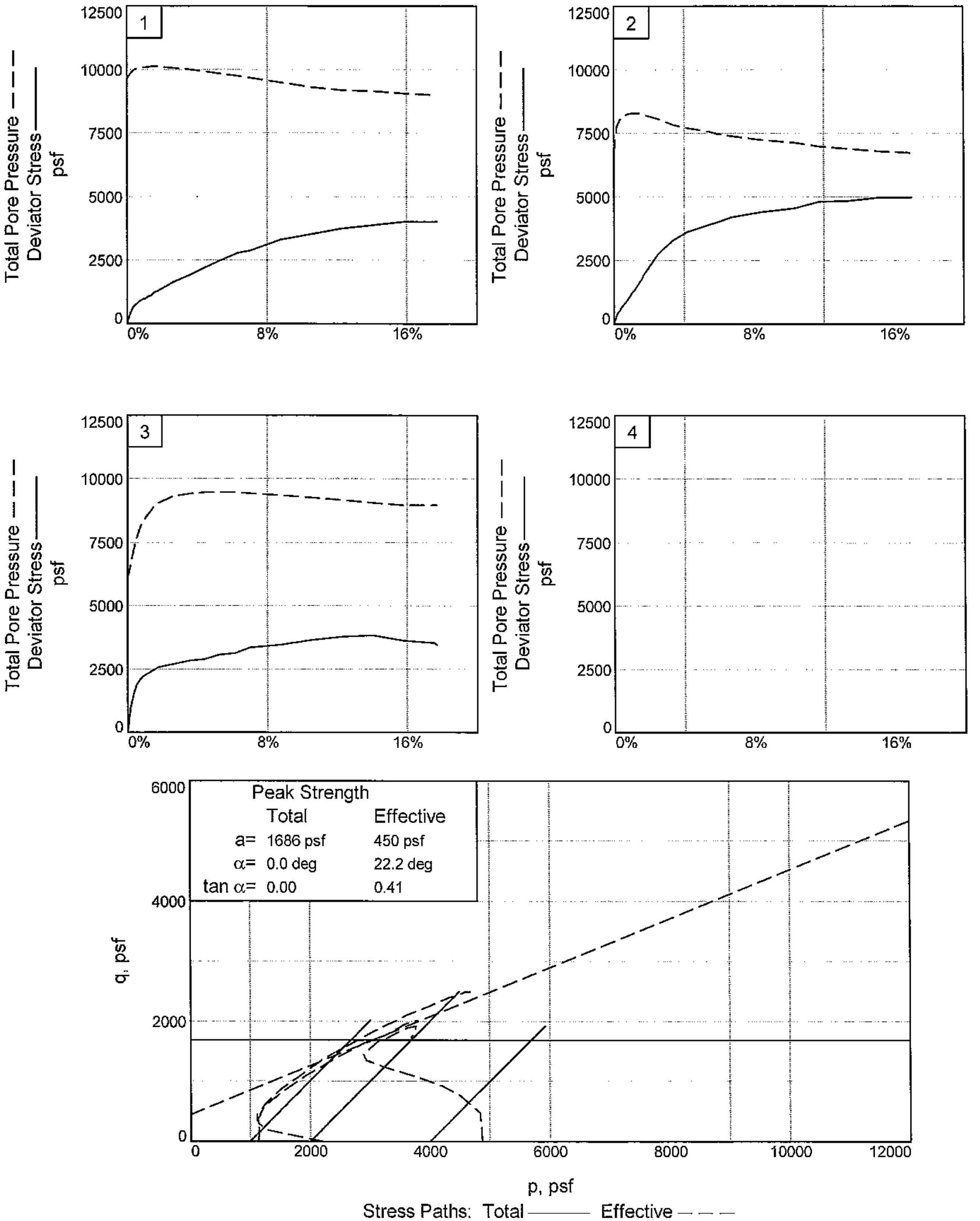
Sample Number: B-10C **Depth:** 15.0 - 17.0 Feet

Proj. No.: 3143-10-1216 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
MACTEC Engineering and Consulting, Inc.
Louisville, Kentucky

Tested By: Tony Oberhausen

Ads



Client: LG&E
Project: LG&E Cane Run Station
Location: Dead Storage Pond / Basin Pond **Depth:** 15.0 - 17.0 Feet **Sample Number:** B-10C
Project No.: 3143-10-1216 **Figure** ________ **MACTEC Engineering and Consulting, Inc.**

Tested By: Tony Oberhausen

DIRECT SHEAR TEST RESULTS

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

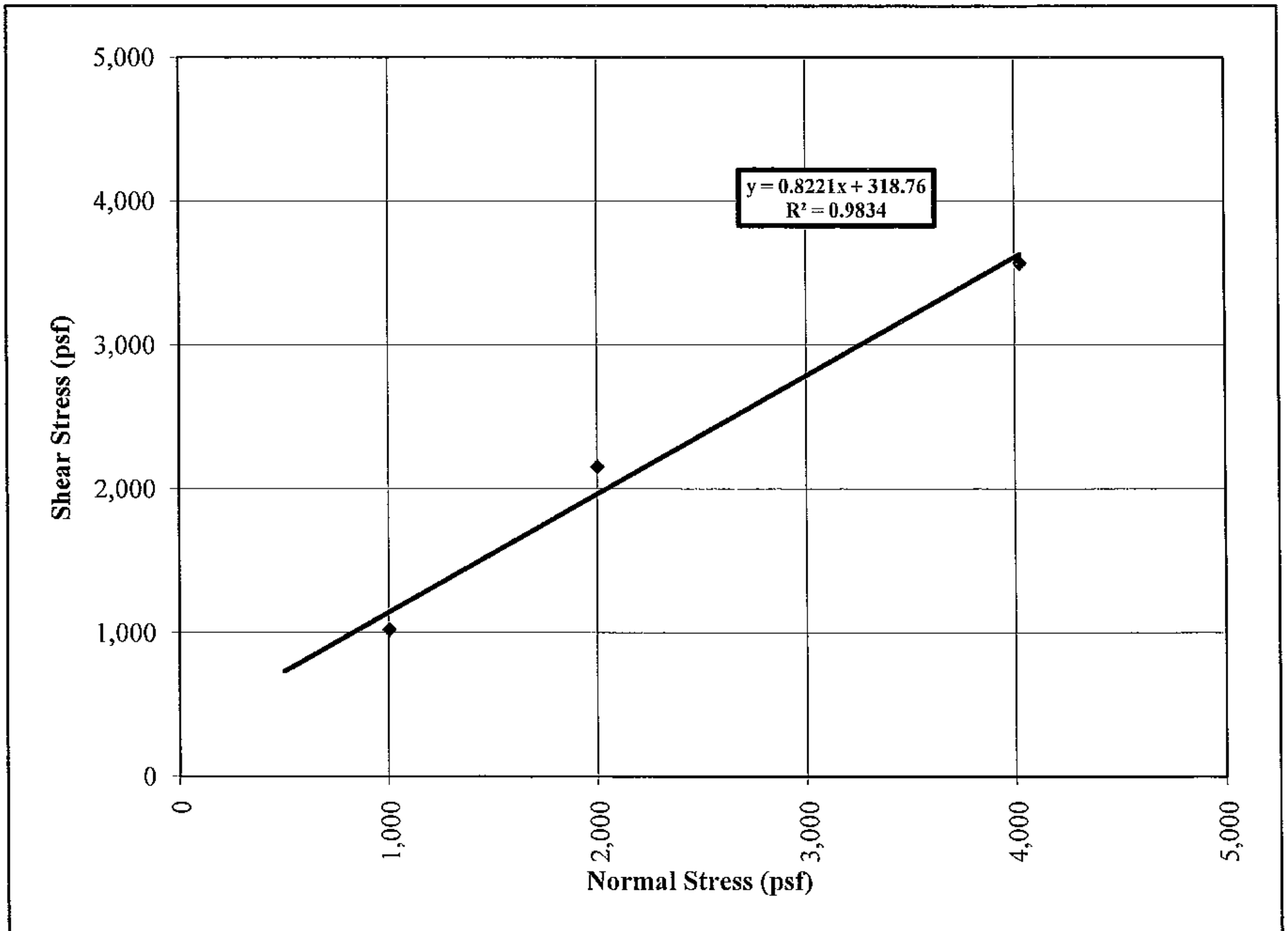
Date Tested: 2/16/10 **Lab No.:** ________
Project: Dead Storage Pond/ Basin Pond
Project No.: 3143-10-1216

Boring: B-10C **Depth:** 35 to 37 feet
Sample Description:
Brown, well graded SAND with gravel (sample sieved to remove material retained on No. 4 Sieve)

SUMMARY OF TEST RESULTS

Normal Stress, psf	1002	2001	4026
Shear Stress, psf	1,018	2,150	3,567
Initial Moisture Content, %	3.86%	4.18%	4.18%
Initial Dry Density, pcf	103.9	103.7	104.3
Final Moisture Content, %	14.6%	14.6%	14.2%

Cohesion: 319 psf
Angle of Internal Friction: 39 °



Reviewed By: ________

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

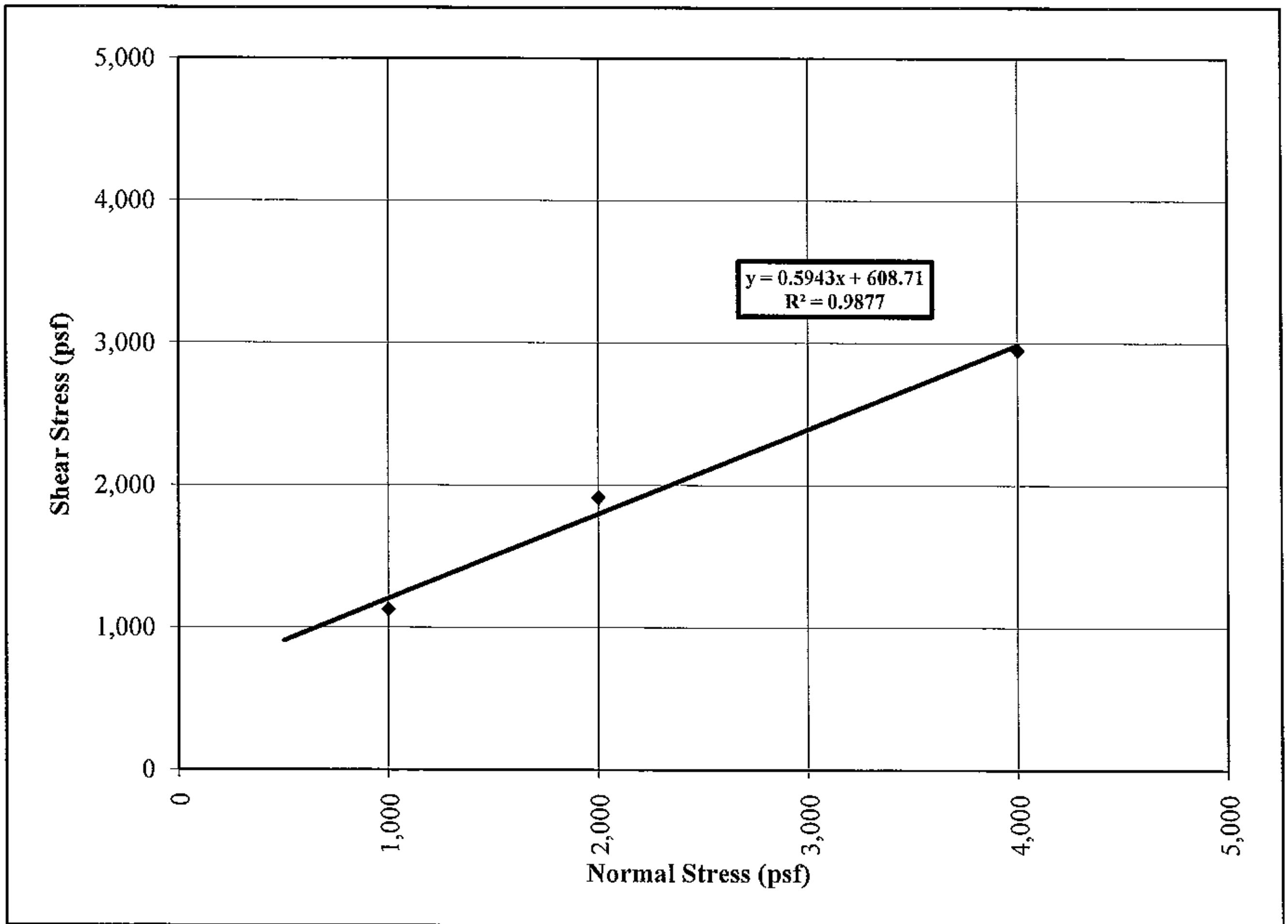
Date Tested: 2/17/10 **Lab No.:** ________
Project: Dead Storage Pond/ Basin Pond
Project No.: 3143-10-1216

Boring: B-11C **Depth:** 25 TO 27 feet
Sample Description: Orangish Brown, silty SAND (remolded sample)

SUMMARY OF TEST RESULTS

Normal Stress, psf	1000	2001	4001
Shear Stress, psf	1,126	1,913	2,948
Initial Moisture Content, %	20.97%	21.19%	21.97%
Initial Dry Density, pcf	104.9	105.9	94.3
Final Moisture Content, %	19.6%	20.5%	18.8%

Cohesion: 609 psf
Angle of Internal Friction: 31 °



Reviewed By: ________

MACTEC

MACTEC Engineering and Consulting, Inc.
13425 Eastpoint Centre Drive; Suite 122
Louisville, Kentucky 40223

Direct Shear Test (ASTM D 3080-04)

Date Tested: 2/15/10 **Lab No.:** ________

Project: Dead Storage Pond/ Basin Pond

Project No.: 3143-10-1216

Boring: B-12C **Depth:** 5 TO 7 feet

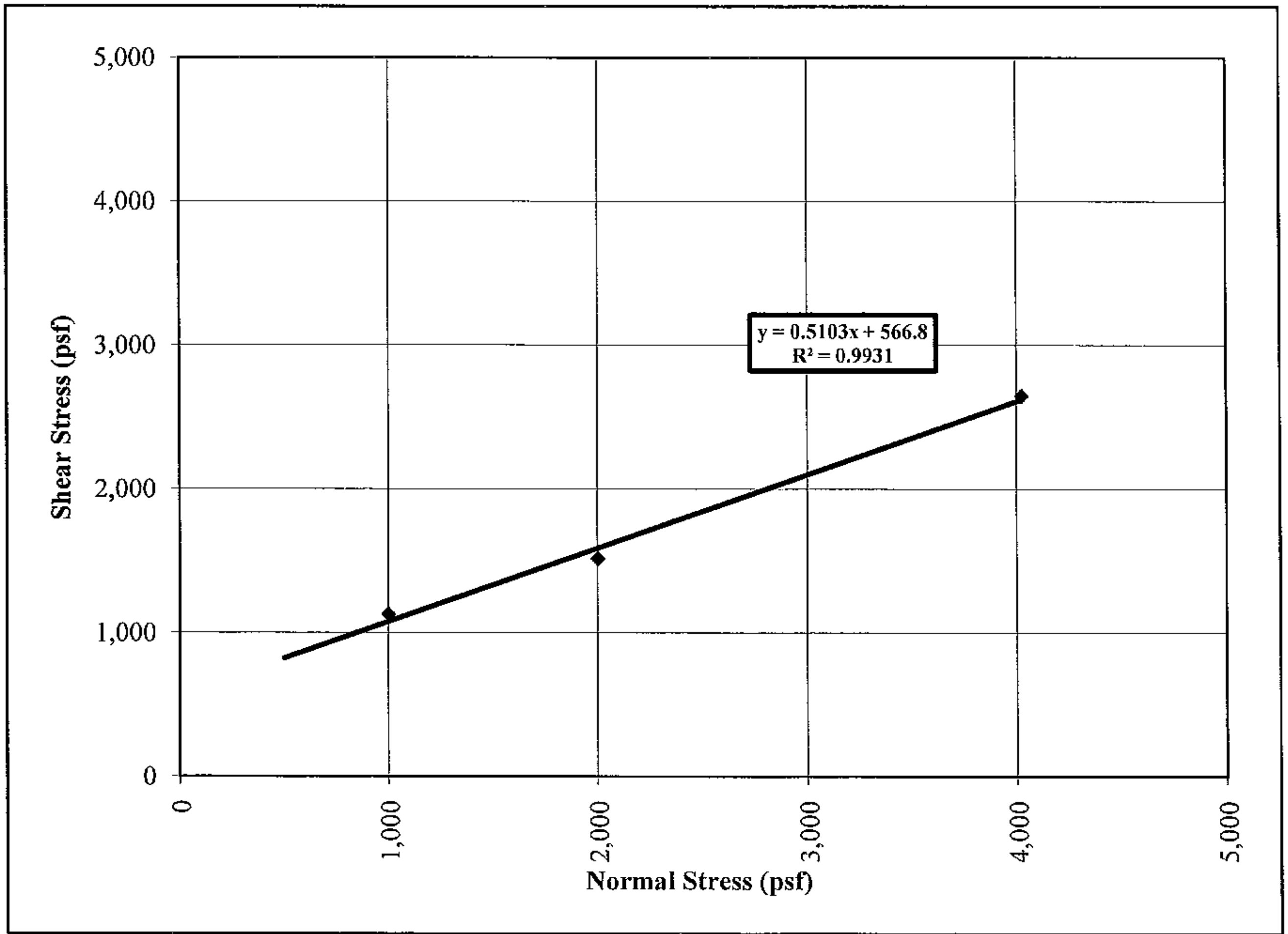
Sample Description: Brown, lean CLAY

SUMMARY OF TEST RESULTS

Normal Stress, psf	999	2001	4026
Shear Stress, psf	1,126	1,514	2,646
Initial Moisture Content, %	25.79%	24.85%	24.83%
Initial Dry Density, pcf	95.1	97.0	99.6
Final Moisture Content, %	26.1%	25.1%	25.3%

Cohesion: 567 psf

Angle of Internal Friction: 27 °



Reviewed By: [signature]

SUMMARY OF SLOPE STABILITY RESULTS

PCSTABL PLOTS

MACTEC

Project:	Cane Run Station
Project No.:	3143-10-1216
Prepared By:	ALB	Date: 2/20/2010
Checked By:	CRV	Date: 2/20/2010

Results of Slope Stability Analyses - Dead Storage Pond / Basin Pond Complex

Critical Section	Upstream Slope (H:V)	Downstream Slope (H:V)	Long-Term Steady State (Pool Elevation 456.5')		Maximum Surcharge Pool (Crest Elevation)		Rapid Drawdown		Seismic	
			Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS
11 Upstream	0.7 : 1.0 1.7 : 1.0 2.5 : 1.0	-	1.5	1.7	1.4	2.7	1.2	1.7	1.0	1.6
11 Downstream	-	1:7 : 1.0 2.8 : 1.0	1.5	2.6	1.4	2.6	1.2	2.6	1.0	2.3

*Target Factor of Safety References: Design Criteria for Dams & Associated Structures (401 KAR 4:030, KAR 4:040)
USACE EM 1110-2-1902: Slope Stability

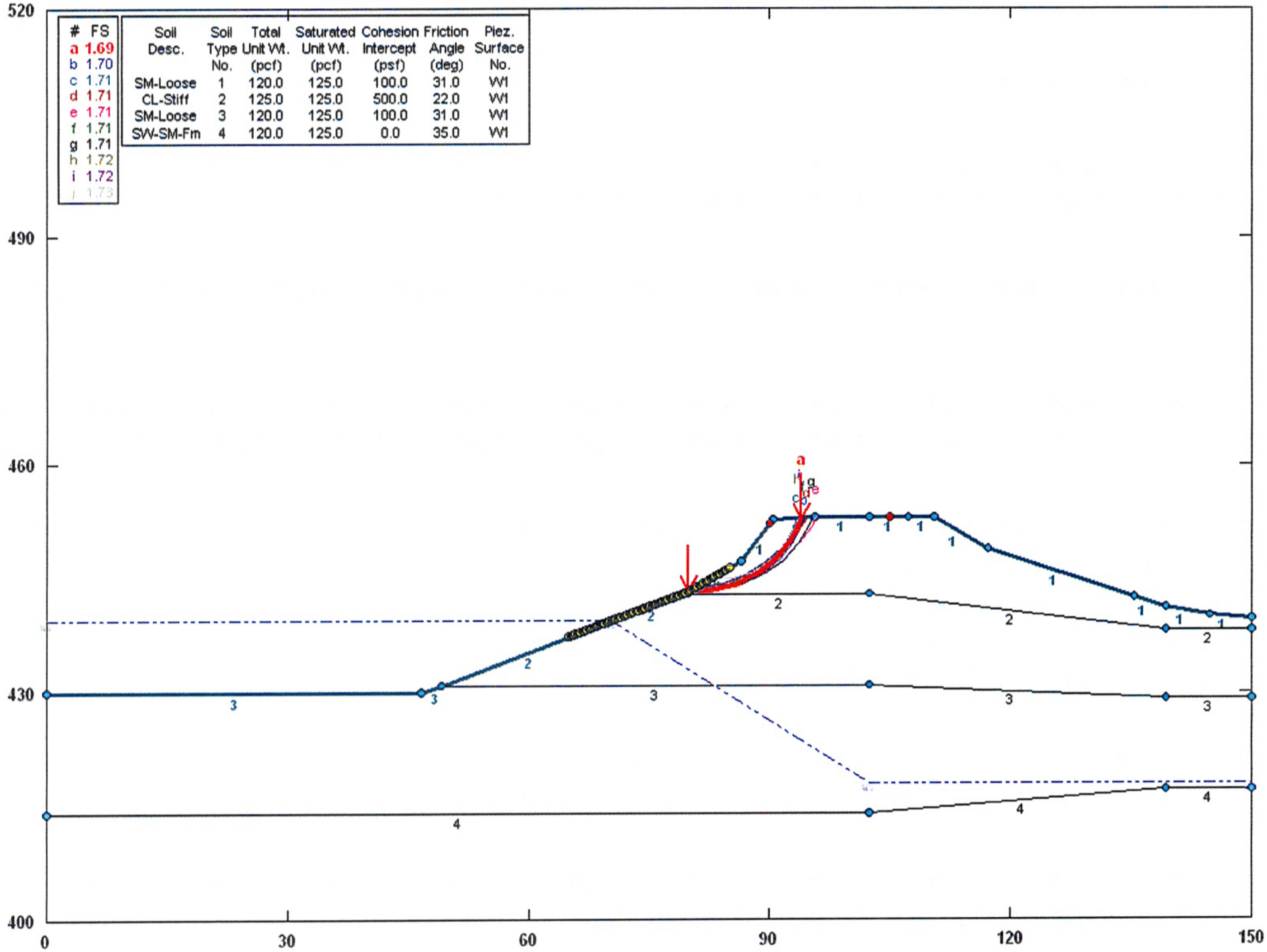
Note: Upstream and downstream slopes varied (steeper slopes encountered nearest crest)

Cane Run Station: Section 11, Upstream, Steady State

C:\STEDWIN\CANERU~1\S11\UPSTREAM\11_SS.PL2 Run By: MACTEC albrenneman 2/20/2010 5:00PM

#	FS
a	1.69
b	1.70
c	1.71
d	1.71
e	1.71
f	1.71
g	1.71
h	1.72
i	1.72
j	1.73

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
SM-Loose	1	120.0	125.0	100.0	31.0	W1
CL-Stiff	2	125.0	125.0	500.0	22.0	W1
SM-Loose	3	120.0	125.0	100.0	31.0	W1
SW-SM-Fm	4	120.0	125.0	0.0	35.0	W1



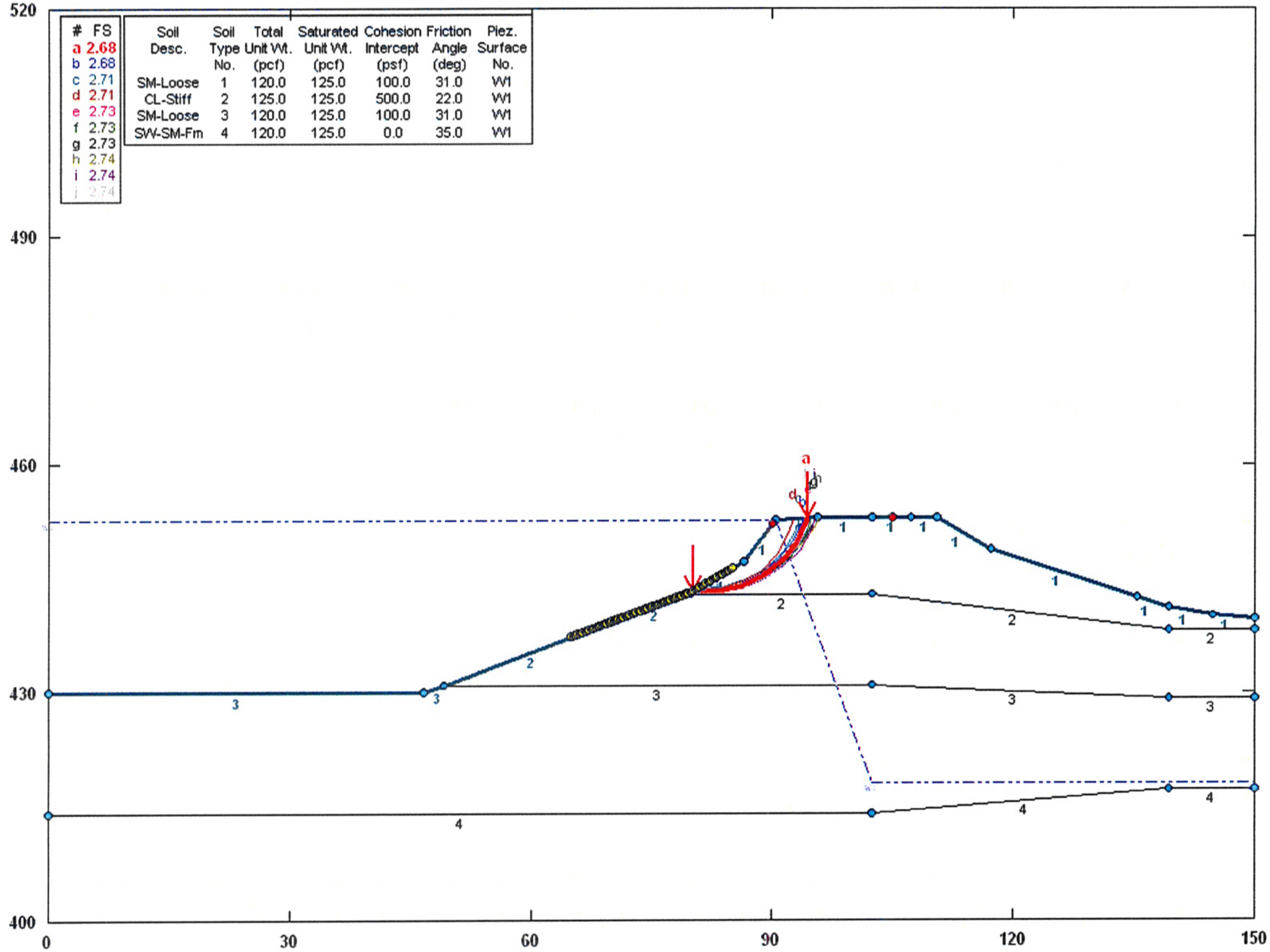
STABL6H FSmin=1.69

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 11, Upstream, Maximum Surcharge Pool

C:\STEDWIN\CANERU~1\S11\UPSTREAM\11_FLOOD.PL2 Run By: MACTEC albrenneman 2/20/2010 4:55PM



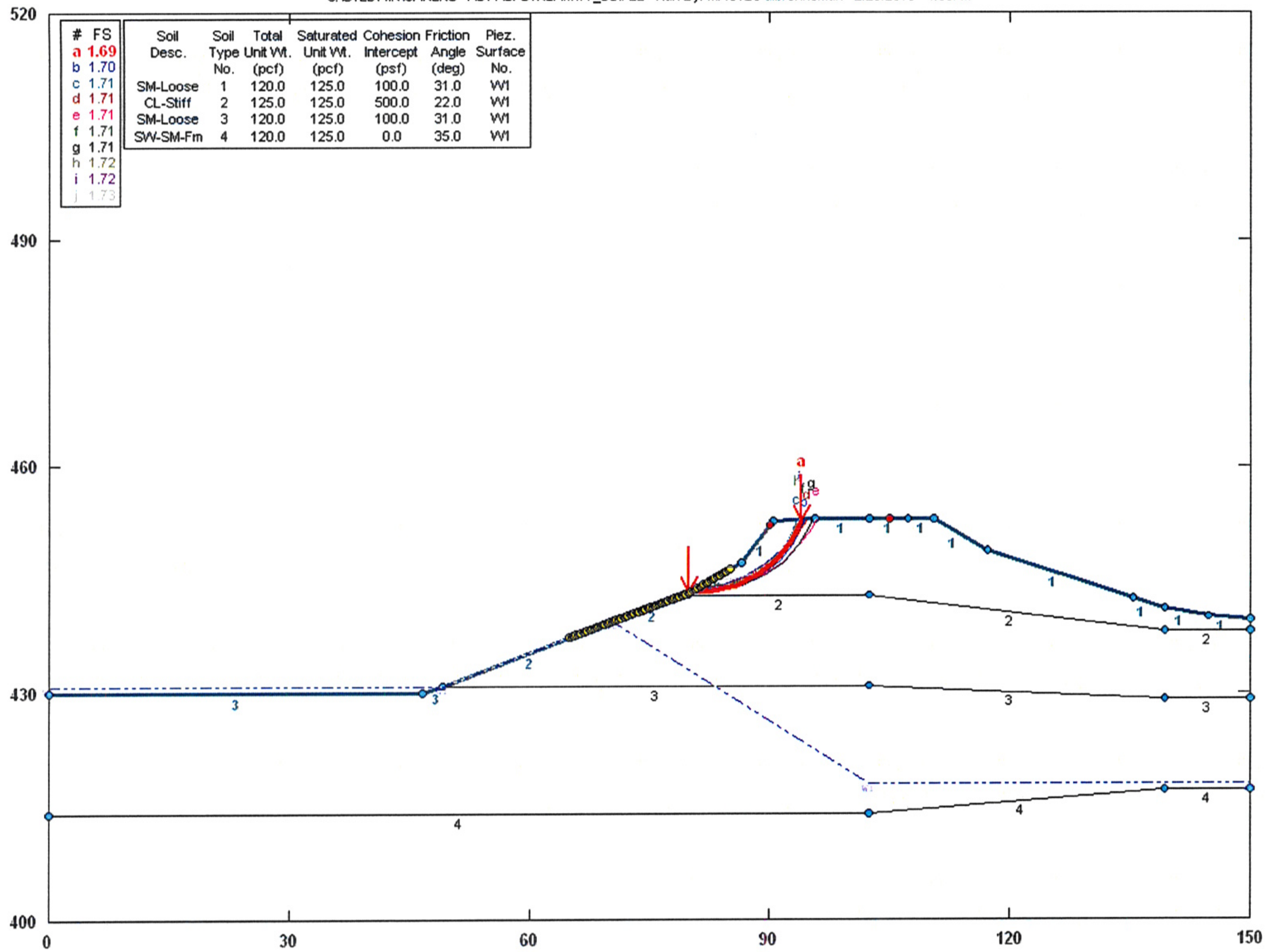
STABL6H FSmin=2.68

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 11, Upstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S11\UPSTREAM\11_SS.PL2 Run By: MACTEC albrenneman 2/20/2010 4:58PM



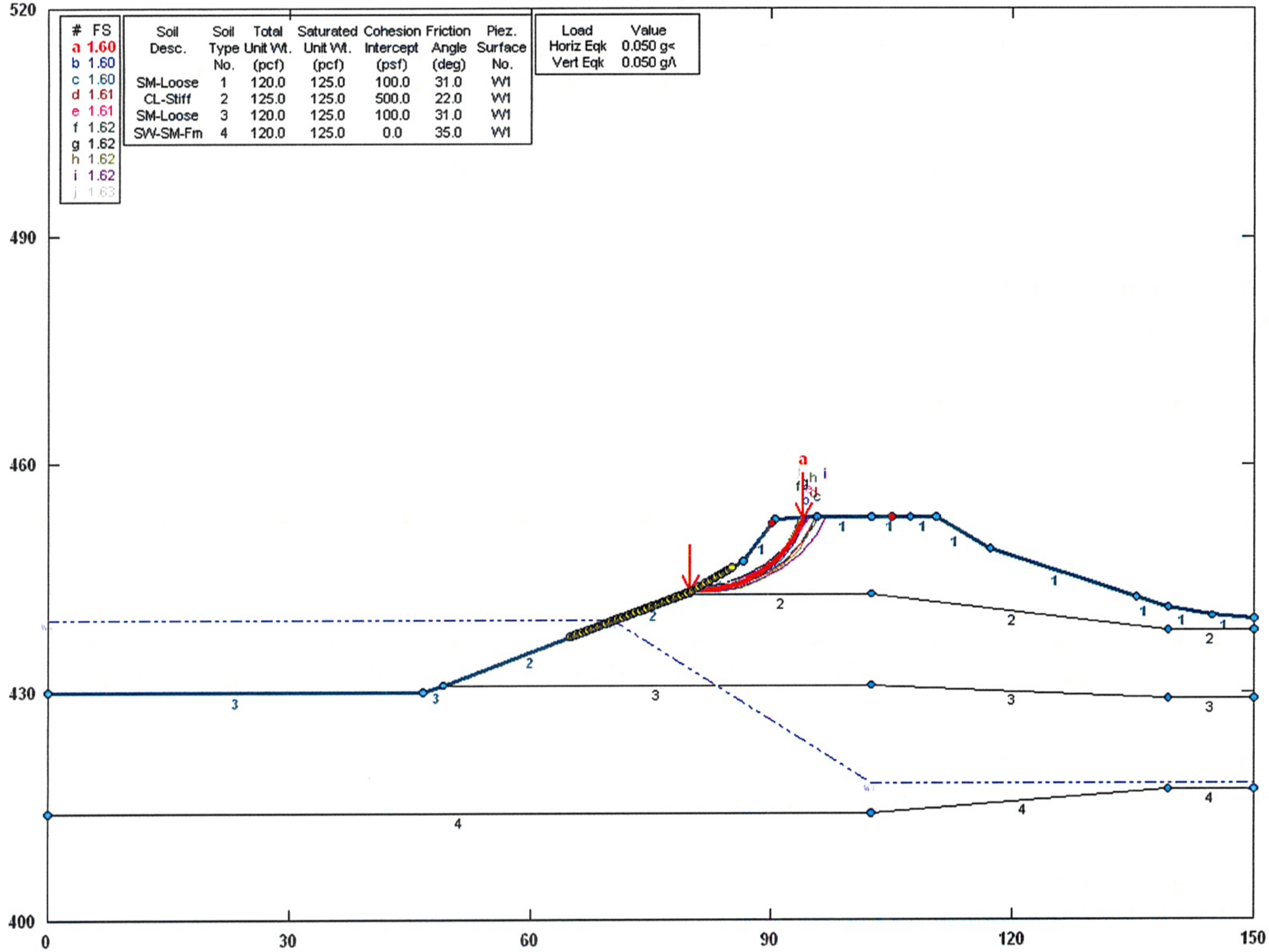
STABL6H FSmin=1.69

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 11, Upstream, Seismic

C:\STEDWIN\CANERU~1\S11\UPSTREAM\11_QUAKE.PL2 Run By: MACTEC albrenneman 2/20/2010 4:56PM

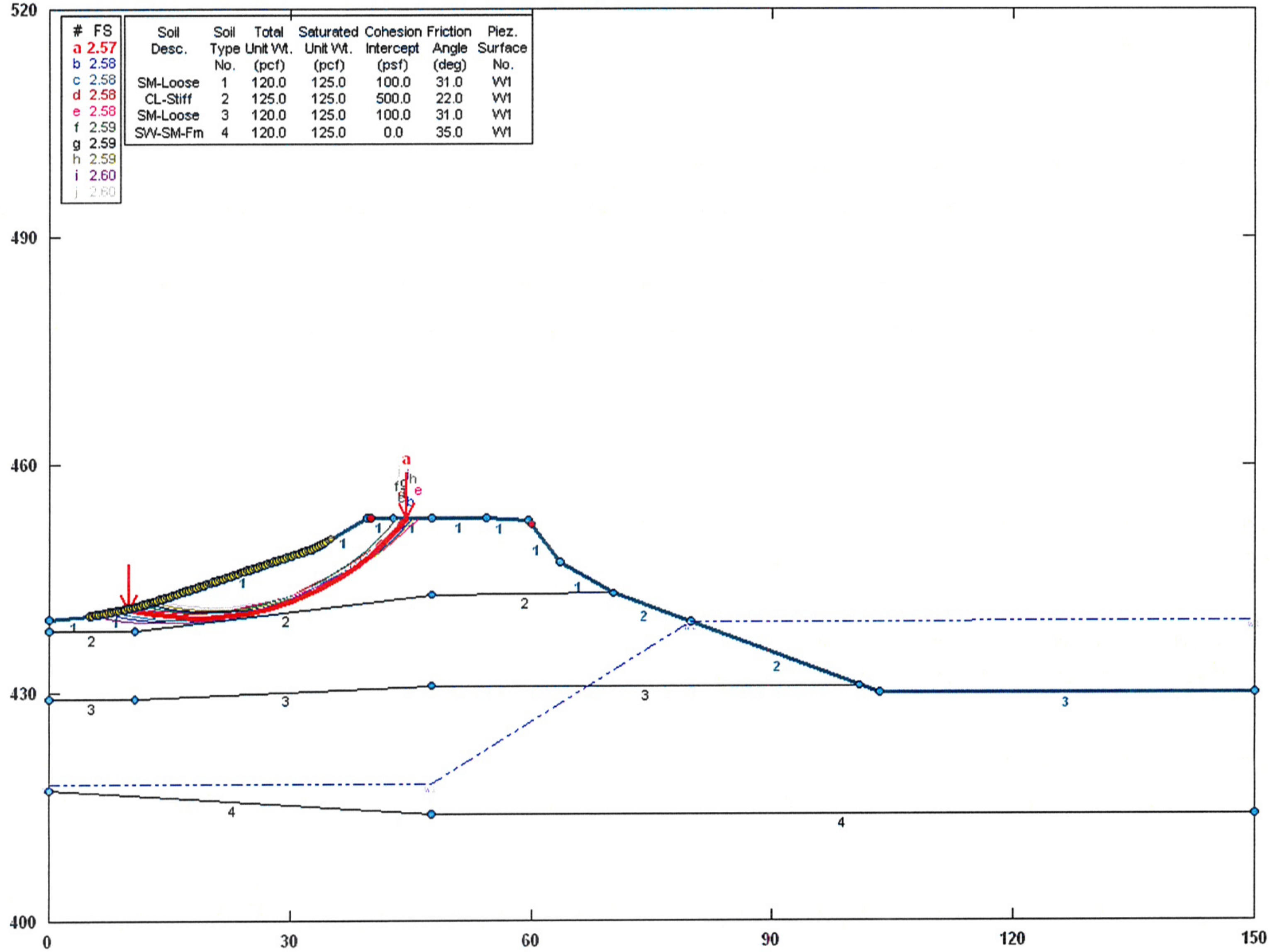


STABL6H FSmin=1.60

Safety Factors Are Calculated By The Modified Bishop Method

Cane Run Station: Section 11, Downstream, Steady-State

C:\STEDWIN\CANERU~1\S11\DOWNST~1\11_SS.PL2 Run By: MACTEC albrenneman 2/20/2010 5:00PM



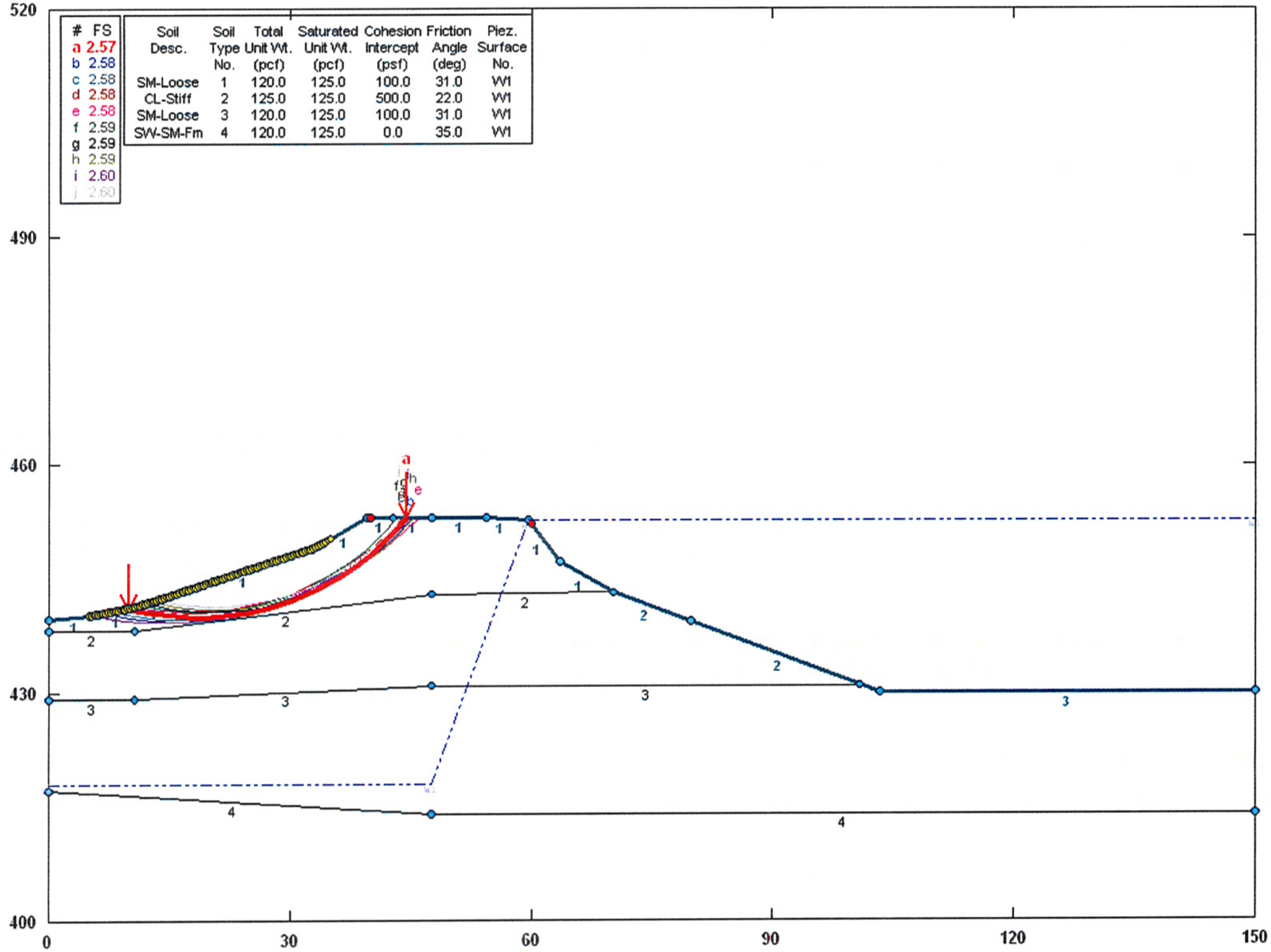
STABL6H FSmin=2.57

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 11, Downstream, Maximum Surcharge Pool

C:\STEDWIN\CANERU~1\S11\DOWNST~1\11_FLOOD.PL2 Run By: MACTEC albrenneman 2/20/2010 5:01PM

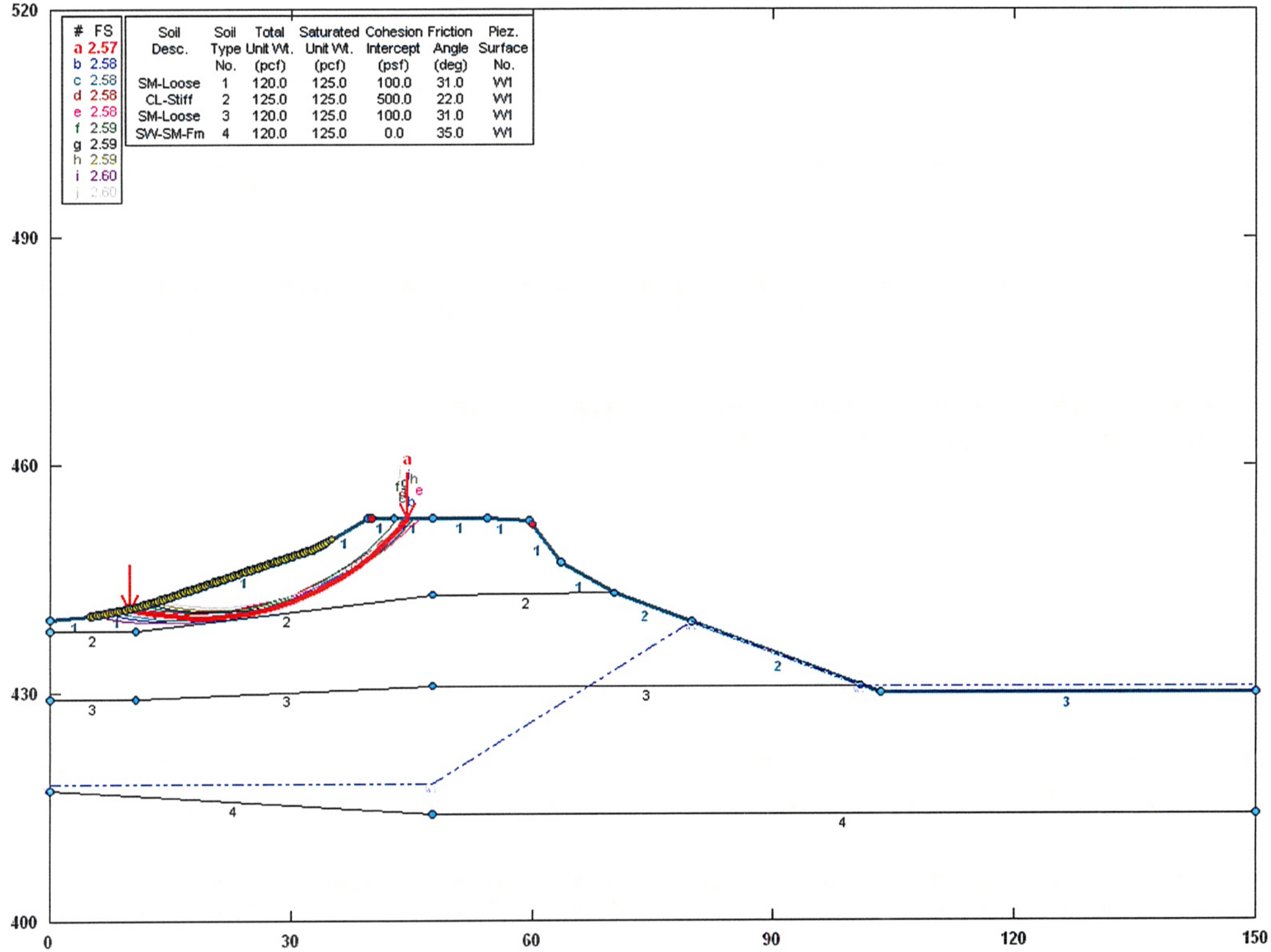


STABL6H FSmin=2.57
Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 11, Downstream, Rapid Drawdown

C:\STEDWIN\CANERU~1\S11\DOWNST~1\11_RDD.PL2 Run By: MACTEC albrenneman 2/20/2010 5:01PM



STABL6H FSmin=2.57

Safety Factors Are Calculated By The Modified Bishop Method

STED

Cane Run Station: Section 11, Downstream, Seismic

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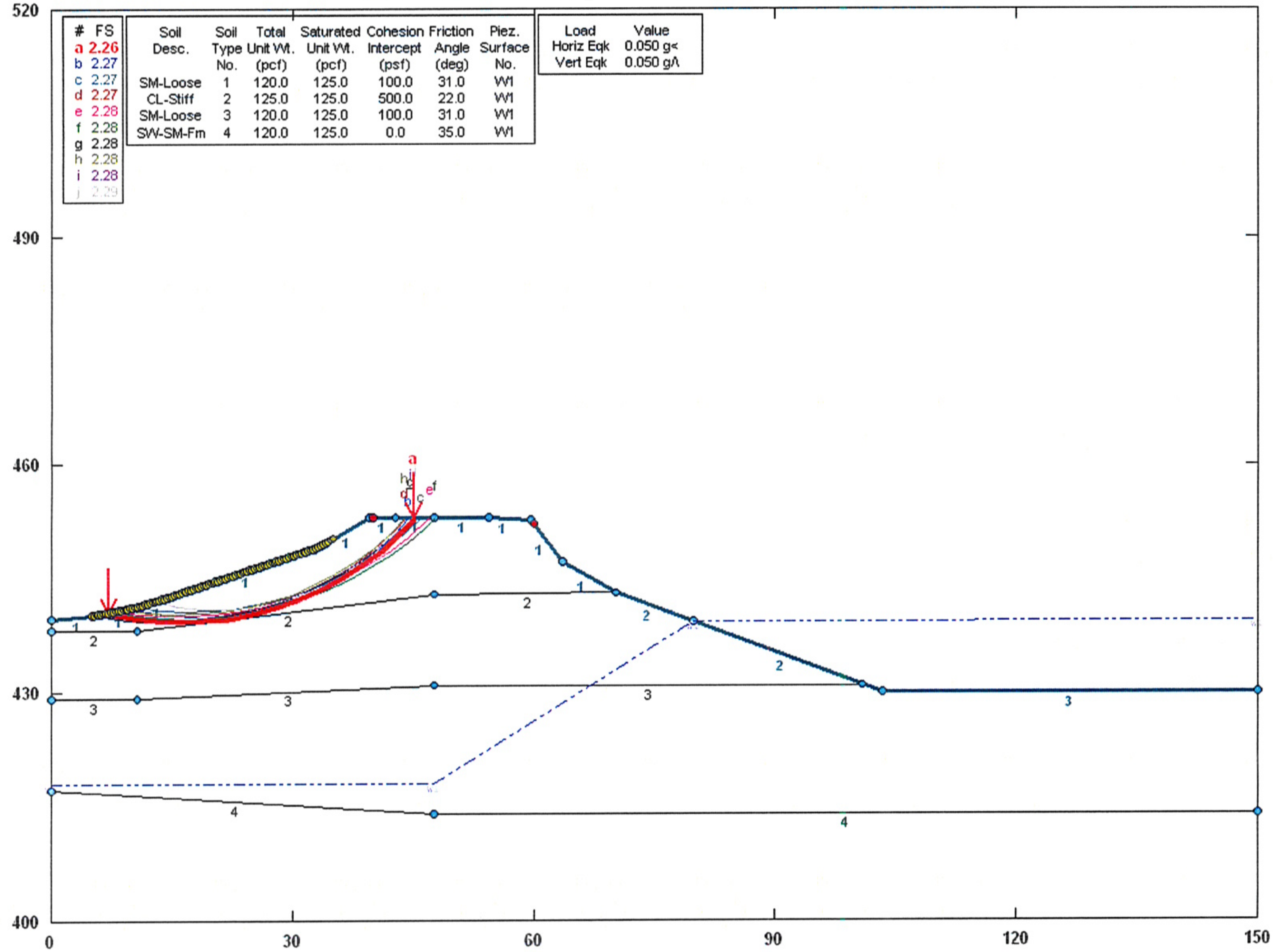

STABL6H FSmin=2.26
Safety Factors Are Calculated By The Modified Bishop Method